

# SUPPLY CHAIN MANAGEMENT

**MBA IV-Semester (Osmania University)**



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# UNIT 1

## Introduction to Supply Chain Management

### LEARNING OBJECTIVES

After studying this unit, one would be able to understand,

- ❖ The Concept of Supply Chain Management (SCM).
- ❖ Objectives and Functions of Supply Chain Management (SCM).
- ❖ Conceptual Framework of Supply Chain Management (SCM).
- ❖ Development and Execution of Supply Chain Strategy.
- ❖ Global Supply Chain Management.
- ❖ Value Chain and Value Delivery Systems for Supply Chain Management.
- ❖ Concept of Bull-Whip Effect.

### INTRODUCTION

Supply chain is a group of network existing between different individuals both in service and manufacturing organizations, although the complexity of chain may vary from industry to industry and from firm to firm.

Supply chain management involves the integration of activities associated with the flow of information and raw materials from the production site till they reach the end-users (i.e., in the form of finished goods) by establishing effective supply chain relationships.

Due to globalization, SCM has become a necessity especially for the firms who are carrying out manufacturing activities to deliver products at low cost and at higher quality than their competitors do.

In today's business era, "globalization is found to be offering many opportunities and challenges for both logistics and supply chain operations. Firms are expanding globally with an intention of minimizing costs. In such a competitive environment, success can be achieved by identifying opportunities with the help of two vectors namely, cost-led productivity vector and customer-led/market-led vector. These opportunities include market expansion, product differentiations, human and material resources advantages. However, it should be noted that some regions of the world enable the firm to achieve significant economies of scale due to their competitive wage scales, while other requires expertise due to significant flexibility in those regions.

The value chain is a type of supply chain wherein the relationships and interdependencies between the suppliers, buyers, intermediaries and customers can be identified. The main purpose of value chain analysis is to identify the 'value' that has to be created for customers which acts as a major source of achieving competitive advantage. 'Value' is the networth of disposable income spent by the individuals in acquiring firm's goods/services.

### 1.1 INTRODUCTION TO SUPPLY CHAIN MANAGEMENT – CONCEPT, OBJECTIVES AND FUNCTIONS OF SCM

**Q1. Explain in detail the concept of supply chain management.**

**Answer :**

#### Supply Chain Management (SCM)

Supply chain is a group of network existing between different individuals both in service and manufacturing organizations, although the complexity of chain may vary from industry to industry and from firm to firm.

Supply chain management involves the integration of activities associated with the flow of information and raw materials from the production site till they reach the end-users (i.e., in the form of finished goods) by establishing effective supply chain relationships.

Due to globalization, SCM has become a necessity especially for the firms who are carrying out manufacturing activities to deliver products at low cost and at higher quality than their competitors do.

The concept of supply chain management can be better understood with the following definitions,

1. "Supply chain integrates the key business processes of an organization from end-user through original suppliers that provide products, services and information that add value for customers and other stakeholders".

— Stock & Lambert (2001)

2. "A supply chain is a network of facilities and distribution options that are engaged in the procurement of raw materials, transformation of these materials into intermediate and finished products and finally distributing them among the ultimate customers".

— Mohanty & Deshmukh (2004)

Today, success of any business firm not only depends on their ability to manage SCM operations in an efficient manner but also requires their close examination of all the activities of SCM starting from procurement of raw materials till the final production of finished goods.

#### Significance of Supply Chain Management (SCM)

The significant role of Supply Chain Management (SCM) is as follows,

##### 1. Gaining Competitive Advantage

Due to rapid changes occurring in the competitive market situation, most of the businesses not only need to operate at low cost but must also develop their core competencies to distinguish themselves from their competitors. In order to achieve competitive advantage, the firms need to focus on those resources that act as core competencies for the firm while the tasks in which a firm is not proficient must be outsourced, so as to reduce both time and wastages associated with the process.

##### 2. Adds Value to the Products

Today, SCM enable businesses not only to achieve "productivity advantage" but also to have "value advantage", in which reduced cost (cost minimization) can be achieved through productivity advantage while value advantage is used to make differential products which helps the firms to achieve 'differential plus' advantage over their competitor's offerings. Due to simultaneous actions for adding value and minimizing the cost of products, SCM plays an active role in producing innovative products by adopting improved processes which in turn reduces the time of product launch by shrinking the product life cycles.

##### 3. Builds Relationship

As global SCM is an aggregate network of different parties belonging to different countries, SCM acts as a means for establishing effective relationships between these parties

##### 4. Helps in Integrating the Process

SCM is a process which involves all those activities required for the conversion of raw materials into finished goods till they reach the ultimate customer. In this process, the level of efficiency depends on the ability of different parties in effectively carrying out the different activities of SCM.

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**5. Helps in Achieving Economies of Scale**

SCM enables the firm to achieve economies of scale by optimal utilization of resources (by different parties) and also by the adoption of different innovative technologies which helps in producing improved and quality products at a cost which the customers are willing to pay.

**Q2. Discuss the objectives and functions of supply chain management. Also explain the conceptual framework of SCM.**

*(Model Paper-III, Q6(a) | June-17, Q3(b))*

**OR**

**What are the objectives and functions of Supply Chain Management (SCM)?**

**Answer :**

*May/June-13, Q2(a)*

**Objectives of Supply Chain Management (SCM)**

The main objective of supply chain management are as follows,

**1. Reducing Uncertainty**

In SCM, there are three types of uncertainties. They are supply uncertainty, process uncertainty and demand uncertainty. SCM reduces supply uncertainty by identifying reliable vendors which helps in providing accurate information and suitable transport facilities to the firms, while process uncertainty can be minimized by adopting effective maintenance practices and innovative technology which are helpful in preventing machine breakdowns. Adoption of good forecasting techniques and better interaction with customers are found to be useful measures for reducing demand uncertainties.

**2. Reducing Lead Times**

Time required for the process of procurement, conversion and distribution can be minimized by using fast transportation modes, efficient planning practices and innovative process technologies.

**3. Eliminating Non-value Added Activities**

SCM makes use of a concept called "Business Process Reengineering" in which undesirable or non-value-added activities can be eliminated by unifying the tasks which makes the entire supply chain a simple one.

**4. Enhancing Flexibility**

By reducing set-up times and by using flexible manufacturing and assembly techniques, efficiency can be improved. For example, instead of purchasing raw materials in bulk, batches of raw materials provides procurement flexibility.

**5. Achieving Process Quality**

Supply chain management can be made effective by producing quality products as per the standards for the very first time. This can be done by identifying the causes of the quality problems through quality control charts, root-cause analysis etc., and by eliminating them in future courses of action.

**6. Maintaining Uniformity (Modularization)**

Production of variable products require huge amount of inventory which not only increases the operation cost but also makes the entire supply chain a complex process. This can be reduced by standardizing products and services offered by the firm.

**7. Manages Demand**

Unexpected and uncertain demands can be reduced by the usage of effective promotion techniques which enables the firm to control the supply chain, right from the process of demand generation.

**8. Delaying the Process of Differentiation**

The process of value-addition through product differentiation must be carried out only when customer wants something new or innovative. This enables the firm to delay the differentiation process, so that customer needs can be met without holding stocks in the entire chain. For example, assembling the component parts according to the needs of customers, wherever it is required.

**9. Kitting of Supplies**

In case of assembly operations, firm has to procure different components from different suppliers. In such cases, entire process is hindered, if any of the intermediate component is not available with the firm. Under such circumstances, in order to ensure smooth flow of assembly operations, all component parts are kitted into one set, such that there should be continuous flow of operations.

**10. Focusing on 'A' Category**

It is a usual practice that the more valuable products, important segments and customers get special attention when compared to others. Hence, firm must focus more on 'A' category products, segments and customers.

**Functions of Supply Chain Management (SCM)**

For answer refer Unit-I, Page No. 14, Q.No. 3

**Conceptual Framework of Supply Chain Management (SCM)**

For answer refer Unit-I, Page No. 15, Q.No. 5

**Q3. Explain in detail the different functions of Supply Chain Management (SCM).**

OR

Explain the functions of SCM.

**Answer :**

May-14, Q2(b)

Supply chain management is a cross-functional approach which involves the uptake of raw materials from external sources, internal processing of materials into finished goods and then finally, delivering them to the ultimate customers. In today's era, most of the organizations are focussing on their core-competencies by outsourcing raw materials distribution channels etc., with the help of third party who can perform those functions better than the focal firm both in terms of cost and efficiency. The main functions of supply chain management involves,

- (i) Building trust and collaboration among the partners of supply chain.
- (ii) Improving inventory visibility.
- (iii) Reduces carrying cost of inventory etc.

However, following are the three main activities involved in the process of supply chain management,

1. Strategic activities/functions
2. Tactical activities/functions
3. Operational activities/functions.

**1. Strategic Activities/Functions**

It involves the following functions,

- (a) Optimization of strategic network in terms of number, location and size of warehouses, distribution centres and facilities.

- (b) Establishes strategic partnerships with suppliers, distributors and customers that provides different methods like cross docking, direct shipping and third-party logistics that plays an important role in improving operational efficiencies.

- (c) Promotes innovative products through coordination, so that there must be an optimal integration of old and new products in supply chains.

- (d) Provides IT infrastructure for facilitating smooth supply chain operations.

- (e) Promotes make-or-buy decisions.

**2. Tactical Activities/Functions**

It includes,

- (a) Establishment of sourcing contracts and other decisions related to procurement, purchase, inventory etc.

- (b) Production decisions include decisions regarding locations, outsourcing process planning etc.

- (c) Transportation strategy by considering formulates modes, frequency and other criteria of transportation.

- (d) Implementation of benchmarks to bring the best possible results to the focal firms.

**3. Operational Activities/Functions**

- (a) Preparing production schedules of each manufacturing unit.

- (b) Inbound operations of SCM like transportation of raw materials from suppliers.

- (c) Outbound operations involve the internal processing of raw materials and final distribution of finished goods to the end users.

- (d) Production operations including the consumption of materials and the flow of finished goods.

- (e) Demand planning and forecasting, coordinating all the results of demand forecasting and communicating the same with the suppliers.

**Q4. Discuss the evolution of supply chain management over the period of time.**

**Answer :**

The concept of supply chain was prevalent since the evolution of trade and its evolution in India can be dated back to 5000 years BC. The India's leading role in trade during those days was destroyed by the invasion by British and others, due to which it was not in a position to perform its trade efficiently and effectively. In the same way, the remnants of supply chains and efficient operations in the world are followed from thousands of years.

After the first industrial revolution, the firms adopted factory system. This system was efficient but followed fragmented supply chain approach. In this approach, each and every department was separate and they were not friendly with the other trading organisations such as suppliers, wholesalers, dealers etc.

However, the above situation was changed after the second Industrial Revolution as Toyota production system in Japan. The usage of this concept was increased with the introduction of MRP Systems, MRP-II systems, and ERP systems. This led to the evolution of the organisation as a single entity and reinforcement of internal supply chain.

The ERP system was responsible for the formation of highly integrated organisations handling equally integrated other organisations. The various trading organisations become partners with the increased relationship among them. All these finally led to the concept of supply chain management. Hence the concept of supply chain was prevalent since long back but the concept of supply chain management is new.

From the above discussion, it can be inferred the SCM function lead to the integrated evolution of manufacturing management and logistics management functions. The logistics management has intum evolved from the integrated evolution of materials management and sales and distribution management.



Figure: Evolution of SCM Function

## 1.2 CONCEPTUAL FRAMEWORK OF SCM

Q5. Explain the conceptual framework of SCM.

(Model Paper-I, Q6(a) | May/June-16, Q2(a))

OR

Describe briefly about the various elements of conceptual framework of SCM.

Answer :

The conceptual framework of SCM is mainly used for designing and managing an effective supply chain process in an organization. This framework is a combination of three structural elements which are as follows,

1. The supply chain network structure
2. The supply chain business process and
3. The SCM components, as shown in the figure,

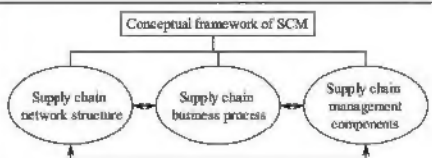


Figure: Conceptual Framework of SCM

### 1. Supply Chain Network Structure

As the name indicates, it is a network of operating firms, consumers and all other parties responsible for the conversion of raw materials into finished goods.

Normally, firms have to maintain more than one supply chain because they have to deal with different parties of the chain during their operations. Hence, firms must focus on maintaining effective relationships with these parties depending on the level of their importance. Before designing a network structure, firms must be aware of the following three primary aspects of network structure,

- (a) Supply chain members
- (b) Structural dimensions of supply chain/network
- (c) Different process links.

### 2. Supply Chain Business Process

Traditionally, supply chain activities (upstream and downstream activities) were treated as separate entities but in recent times, all such activities have been combined to form an effective supply chain process.

In those days, marketing executives were responsible for identifying the demand for a product, based on this the purchase department places an order and satisfies its customers.

Integrated supply chain becomes functional only if it has all the relevant information required for its proper functioning. Customer centered system can be achieved by processing accurate information and in a timely manner. However, it is not easy to process the information accurately as, SCM has to face various issues related to the uncertainty of customer demand, manufacturing processes and performance of suppliers etc.

The members of Global Supply Chain Forum identified the following key supply chain processes,

- (i) Customer relationship management
- (ii) Customer service management
- (iii) Demand management
- (iv) Customer order fulfillment
- (v) Manufacturing flow management
- (vi) Procurement
- (vii) Product development and commercialization
- (viii) Returns.

### 3. Management Components of SCM

It is the third element of SCM framework. The level of integration among the business process links is highly dependent on the number of management components.

Nine management components are identified based on the interviews conducted with eighty managers, which are as follows,

- (i) Planning and control
- (ii) Work structures
- (iii) Structures product flows
- (iv) Management methods
- (v) The power and leadership structure
- (vi) Reward and risk structures
- (vii) Organization structures
- (viii) Channels of information flows
- (ix) Culture and attitude.

Hence, for the successful implementation of SCM frameworks all these components need to be integrated strongly which results in the formation of an effective supply chain.

#### Q6. Write briefly about the primary aspects of network structure.

**Answer :**

The three primary aspects of network structure of supply chain management are as follows,

#### 1. Supply Chain Members

Critical members of supply chain who are responsible for the success of an organization must be identified and should be allocated with managerial attention and scarce resources. Researchers of marketing channels must identify the channel members based on their level of participation in marketing flows, which includes product, title, payment and promotion flows. All these companies/organizations with whom focal firm interacts directly or indirectly constitute the members of supply chain.

The Global Supply Chain Forum has identified two important members of supply chain, "primary members" and "supporting members". Primary members refers to all those companies who are engaged in managerial activities (or value added activities) for the production of specific output for a specific consumer or for a specific market segment. On contrary to this, the supporting members provide only functional or operational assistance to the primary members. Such members provide resources, knowledge, expertise, utilities or assets, that are required by the primary members for carrying out the process of production.

For example, supporting companies include those suppliers who supply raw materials and other utilities to the focal firm.

It is also possible for the same company to act both as a primary and a supporting member by undertaking both the activities of supply chain. Hence, every firm must focus on the functioning of primary and supporting members for the effective management of its activities.

#### 2. Structural Dimensions of Network

Basically, three structural dimensions are used for describing, analyzing and managing the supply chain, which are as follows,

- (i) Vertical structure
  - (ii) Horizontal structure and
  - (iii) Horizontal position of a focal company between the terminal points of the supply chain.
- (i) Wherein, the horizontal structure refers to the total number of levels present across the supply chain. Depending on the number of levels, supply chain may be considered as short, medium or long.
- For example, the network structure of a manufacturing firm is vast, as it has to maintain intricate relationships with large number of suppliers, consumers, stakeholders etc.
- (ii) Whereas, the vertical structure refers to the total number of individuals (consumers/suppliers) present at each level of supply chain. Such structure may be narrow or vast depending on the density of individuals (i.e., Density is a term used to describe the large number of individuals at each level).
- (iii) The third component represents the position of a focal firm within the supply chain. Various combinations of such structures can be used by the firms depending on the nature of operations.

Structure of supply chain is mainly influenced by activities like outsourcing of logistics, manufacturing, marketing or financial operations. Such factors are responsible for increasing either the depth or the width of supply chains.

#### 3. Different Process Links

In SCM, different types of links are available depending on the functions performed by the partners of supply chain. However, the hierarchy of supply chain initiates from the focal firm which acquires materials from different suppliers, processes them and forms finished products. Such products are stored in warehouses, from there they can be transferred to retailers via the appropriate distribution channel. From retailers, they finally reaches the consumers where the process of forward supply chain comes to an end.

Focal Firm → Suppliers → Manufacturing Site → Warehouse → Distributor → Retailers → Customers

**Figure: SCM Linkage**

**Q7. Explain the key supply chain business process suggested by members of Global Supply Chain Forum.**

**Answer :**

The members of Global Supply Chain Forum (GSCF) identified the following key supply chain processes.

**(i) Customer Relationship Management Process**

Integrated process of SCM initiates with the identification of key customers or key groups, which forms a part of business mission. Depending on such customers, firms must design the performance agreements which enables them to get an information regarding the performance of their services as well as customer profitability.

**(ii) Customer Service Management Process**

Customer service acts as a major source of customer information. Customers are satisfied only if the firm is able to provide them with the required information on the promised shipping dates and product availability by interfacing both production and distribution functions.

**(iii) Demand Management Process**

For the effective management of demand, firms must align their supply chain capabilities with that of customer's requirements. Based on the point-of-sale data or key customer data, firms must forecast demand for their products/services, so that they can ensure smooth flow of information/products throughout the supply chain. Thus, in order to allow market requirements and production plans to be coordinated on an organization wide basis, multiple sourcing and routing options need to be used at the time of order receipts.

**(iv) Customer Order Fulfillment Process**

As every customer wants to achieve their requirements within a short span of time, firms need to produce a seamless process from the suppliers to themselves and then finally on to its customer segments, so that orders can be fulfilled within the short duration of time.

**(v) Manufacturing Flow Management Process**

Traditionally, firms were producing products based on the historical data of customers. This sometimes leads to the production of wrong/inappropriate product mix which increases the production cost, inventory carrying cost etc. In order to prevent such productions, firms need to design flexible manufacturing processes, such that they can produce products based on the changing requirements of customers.

**(vi) Procurement Process**

Strategic plans, developed with suppliers not only helps in supporting the production process but also plays an important role in the development of new products. On a global scale, global sourcing must be carried out for extending the business operations throughout the world.

For procurement of raw materials and innovative technologies, firms are entering into strategic partnerships with other firms, wherein both the parties are mutually benefited. Such type of relationship is considered to be a "symbiotic relationship". Nowadays, the purchase departments are well versed with the rapid communication mechanisms such as EDI and internet linkages, which helps in reducing both the time and cost spent on the transaction process. Due to the development of such mechanisms, firms can focus on their core business activities instead of placing orders and expediting.

**(vii) Product Development and Commercialization Process**

"If new products are the life-blood of a corporation, then product development is considered as the life of a company's new products". Product life cycle can be reduced, by integrating both suppliers and customers in the product development process which is helpful in reducing the marketing time, such that new products can be launched within short span of time.

Managers of the product development and commercialization process must perform the following three functions,

1. Must interact with customer relationship management to identify both realized and unrealized needs.
2. Depending on the procurement needs, suppliers and materials must be selected.
3. Depending on the existing market conditions, they must develop production technology for manufacturing the innovative products.

**(viii) Returns Process**

Effective process management, a component of returns process help the firm in identifying the opportunities of productivity improvements, which in turn increases the returns to scale.

### 1.3 SUPPLY CHAIN STRATEGY

**Q8. What is a Supply Chain Strategy? Write about the development of supply chain strategy.**

**Answer :**

*Model Paper-III, Q6(b)*

**Supply Chain Strategy**

Supply chain strategy is a broader term which mainly focuses on the methods of operations of supply chain in order to achieve competitive edge over competitors. Supply chain strategy is a continuous process, in which operational components are continuously analyzed to assess their cost-benefit trade-offs. Supply chain strategy is mainly responsible for creating value for both the company as well as for its stakeholders. An effective supply chain strategy along with innovative technologies not only help in meeting the demands of the market but also help the firm to reach the highest level of customer satisfaction.

### Development of Supply Chain Strategy

The following are the points to be considered in the development of integrated logistics supply chain strategy.

#### 1. Acknowledge the Business Strategy

The initial step in the development of a supply chain strategy is to understand the methods adopted by the firm to gain competitive advantage. A well executed supply chain strategy acts as a key driver for business strategy. Every firm must consider its core competencies, resources, goals, and differentiation methods before implementing a business strategy.

#### 2. Evaluation of an Extended Supply Chain

The next step is to carry out a detailed analysis required for the determination of capabilities of both firm and extended supply chain partners. In this step, analysis has to be done by an unbiased external party who may appropriately assist the firms in determining their core strengths and opportunities. After identifying them, establish benchmarks both external and internal to its industry which helps in leveraging its core competencies. Once analysis is done, team must be assembled which is responsible for receiving and prioritizing recommendations, identifying opportunities and risks and finally, assisting the firms for certain implementations. If there exists a disparity between supply chain strategy and operations of assets, firm needs to make further investment or it can even formulate a new strategy from a scratch.

#### 3. Develop an Implementation Plan

Implementation plan of a supply chain strategy must be developed by incorporating activities, tasks, roles, responsibilities, a corresponding timeline and performance metrics. During implementation process, sub-team must be established for its execution by providing project management responsibility which helps them in resolving issues.

#### 4. Development Considerations

##### (i) Establishes Cooperation and Collaboration among Supply Chain Partners

Effective implementation of a supply chain strategy involves the cooperation and collaboration among the supply chain partners. It must be noted that, only general information regarding the operations need to be communicated to/with its partners while highly confidential information need not be disclosed to anyone.

##### Example

Collaboration with technical partner who is using innovative technology not only helps in reducing operational cost and R and D cost but also makes them aware about the new product concepts which cannot be possible while working as a single entity without any collaboration.

##### (ii) Outsourcing

Development of a supply chain strategy includes the identification of certain activities that need outsourcing which plays an important role not only in reducing costs but also in the optimal utilization of competent resources for the development of core competencies where an organization performs better than the outsourcing firm.

#### Q9. Explain briefly the importance and execution of supply chain strategy.

Answer :

##### Importance of Supply Chain Strategy

The importance of supply chain strategy can be understood from the following points,

1. It helps in the operations of the firm and provides support to strengthen business strategy.
2. It reduces the cost of operations and maximizes the total efficiency of the firm.
3. It directs the firms towards goals achievement.
4. It provides the guidelines as to how the firms must operate with its suppliers, customers, distributors, shareholders etc.
5. A well executed strategy enables the firm to create total value for the firm.

##### Execution of Supply Chain Strategy

The strategies of supply chain are executed as follows,

##### 1. Performance Management

Execution of a supply chain strategy involves the close examination of implementation plan by establishing project governance. The first step in execution of supply chain strategy is to closely track the performance measures adopted for the realization of goals. Effectiveness (output/inputs) can be achieved if the individuals are motivated which can be done by rewarding them for their performances.

##### 2. Cost-benefit Analysis

Firms must reexamine its supply chain strategy depending on the changes taking place in today's competitive environment. It must assess whether the business goals are met? Is there any change in the need of supply chain partners? How the industry has changed? (in terms of competitors, structures, business practices, products, technology). It also involves the identification of all those new opportunities that may lead the organization towards the path of success.

### 3. Channelizing Communication among Partners

As it is essential to relate supply chain strategy with the business strategy, it is equally essential to execute supply chain strategy with different types of entities (both external and internal to the firm). Supply chain strategy can be synchronized with its partners by communicating the goals of focal firm to/with its partners, so that there may be a proper alignment between the focal firm and supply chain partners, which is an important prerequisite for the successful execution of a supply chain strategy.

#### 1.3.1 Structural Framework and Components of Supply Chain Strategy

**Q10** Discuss the structural framework of supply chain strategy.

**Answer :**

The framework of supply chain strategy mainly includes the following strategies

- a) Collaborative strategy
- (b) Demand flow strategy
- (c) Customer service strategy
- d) Technology integration strategy

#### (a) Collaborative Strategy

Organizations role in supply chain differ from one organization to other and it affects the capacity of an organization to grab the chances to collaborate with the partners in the industry. The collaborations among the business partners mostly benefits the manufacture in gaining competitive edge over competitors collaborator are basically of 3 types.

##### (i) Manufacturer-supplier Collaboration

Forming making collaborations between manufacturers and suppliers is beneficial to manufacturers with respect to product development, order fulfillment and effective planning of plant capacity and so on.

##### (ii) Manufacturer-customer Collaboration

Forming/making collaboration between manufacturer and customers would benefit the manufacturers in demand forecasting and in planning inventory requirements. It also helps them in gaining higher levels of customer satisfaction through identifying the customers changing needs and expectations.

##### (iii) Collaborations with Logistics Providers

Collaboration of manufacturers with (3P) third party logistics providers facilitates helps the firms in planning the logistics activities combinedly and also adds value to the firm by providing better packaging facilities in order to attract the customers.

Collaboration of manufacturer with 4 PL providers would benefit both the outsourcing and insourcing of supply chain operations.

##### (b) Demand Flow Strategy

Traditional supply chain management basically emphasizes greatly on the movement of goods from suppliers to end users via the manufacturers and distributors. Similarly, demand flow is from end users to suppliers through distributors and manufacturers along the supply chain. But in a contemporary supply chain management demand flow strategy facilitates the organization in formulating an effective supply chain strategy by reducing the complexities in their operations.

##### (c) Customer Service Strategy

Designing a customer service strategy would help the firm in formulating effective supply chain strategy in order to gain higher levels of customer satisfaction. While crafting a customer service strategy firm should consider the following three aspects.

##### (i) Customer Segmentation

It is necessary for a firm to decide their target segment of customers for manufacturing a particular product or service.

##### (ii) Cost to Serve

Firm should assess the feasibility of the firm in producing the product for meeting the customers expectations. It also assess the costs for production and distribution of products to end users and the support provided by the suppliers and other parties involved in supply chain.

##### (iii) Revenue Management

Firm should ascertain the customers needs and expectations and select an appropriate alternative method which would helps in maximizing the firms profitability and minimizes the costs.

##### (d) Technology Integration Strategy

Recent developments and changes in information technology plays an important role in designing supply chain strategy. It can integrate all the information systems of a firm vertically and horizontally with the help of various tools and techniques. The information provided by the information systems helps the management in taking proper decisions with respect to the supply chain operations.

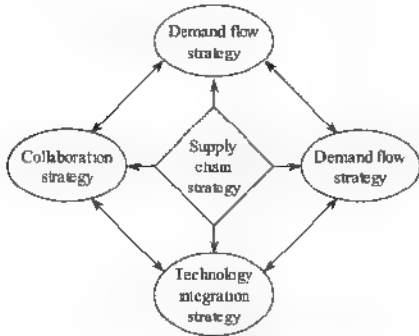


Figure: Structural Framework of Supply Chain Strategy

Q11. Discuss briefly about the various components of supply chain strategy.

Answer :

The following are the key components of supply chain strategy,

1. Sourcing strategy
2. Distribution strategy
3. Inventory strategy
4. Customer service strategy and
5. Integration strategy

#### 1. Sourcing Strategy

Most of the organizations are preferring the phenomena of outsourcing over in-house manufacturing. Outsourcing is a process wherein the focal firm depends on suppliers/vendors for raw materials, quality control mechanisms, production and other functional activities which play an important role in reducing the overall cost of production. Firms may go for either complete or partial sourcing depending on their capabilities. Evans and Danks have classified the sourcing strategy into three elements as follows.

- (i) Manufacturing management
- (ii) Make or buy decisions
- (iii) Capacity management

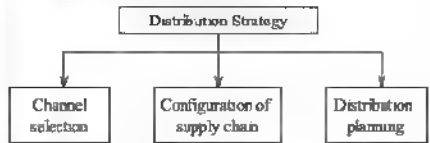


Figure: Sourcing Strategy

#### 2. Distribution Strategy

According to Evans and Danks, "distribution is a linkage between the firm's customers and the sources of its products and services that the firm provides to the market place". It not only deals with decisions regarding the distribution cost (which forms a major percentage of marketing cost), but also considers long-term commitment with certain channels of distribution along with their associated costs. It consists of three elements as follows

- (i) Channel selection
- (ii) Configuration of supply chain and
- (iii) Distribution planning



#### 3. Inventory Strategy

Such strategies mainly deal with inventory decisions. Firms have to face several issues such as whether to stock products or not, if yes, how much volume of inventory has to be maintained. If no, then how the demands of customers can be met. Such issues are often conflicting with each other which has to be resolved as early as possible so that firms carry out smooth flow of operations.

Inventory strategy is a cluster of following three elements.

- (i) Demand Forecasting
- (ii) Inventory Planning
- (iii) Planning of Stocking Facilities.

#### 4. Customer Service Strategy

Evans and Danks have rightly described customer service strategy as a means, channel to respond to the needs and expectations of its customers in a manner that maximizes profitability. Nowadays firms are treating customers as "the most precious asset". Nature of customer service is a differentiating factor in this competitive environment, where firms are no more considered for selling of their products but are known as sellers of relationships, solutions, support and care. Hence, firms need to provide efficient customer service by providing post-warranty support, fast repairs, quick customer responses in returns of their service calls, by competent and user friendly technicians. Following are the factors responsible for the development of customer service strategy.

- (i) Identification of service needs
- (ii) Service cost
- (iii) Revenue management

**5. Integration Strategy**

Traditionally, both suppliers and manufacturers were operating independently but in recent times, supply chain acts as a liaison between the manufacturers and suppliers where products/services are delivered by combining the efficiencies of both the parties. The degree of integration process is directly proportional to the success of supply chain system i.e., the higher the integration process, the greater is the success of a supply chain system. Integration is of three different types,

- (i) Information integration
- (ii) Decision integration and
- (iii) Financial integration

**1.3.2 Issues and Challenges of SCM**

**Q12. Discuss various issues of supply chain management.**

**Answer :**

The issues in Supply Chain Management (SCM) can be studied under three levels which are as follows,

**(i) Strategic Level**

This level emphasizes on the decisions which have an enduring impact on the firm the various decisions which are taken at this level are, decisions about the number, capacity of warehouses and their location, manufacturing plants and the flow of material through the logistics network.

**(ii) Tactical Level**

This level deals with the decisions which are updated after every quarter and after every year.

The decisions which are taken at this level are purchasing and production decisions, transportation strategies, inventory policies, frequency of customer visit etc.

**(iii) Operational Level**

This level deals with the day-to-day decisions like scheduling, lead time quotations, truck loading and routing.

The significant issues, trade-offs and questions related to various decisions are as follows.

**1. Distribution Network Configuration**

The organisations should establish its distribution network efficiently, by selecting a set of warehouse locations, and capacities, ascertaining the production level for each product at each plant and establishing transportation facilities either from the plant to warehouse or from warehouse to retailer.

These activities help in minimizing the overall all production, transportation, inventory and transportation costs and fulfill the service needs. Effective distribution network configuration is a complex optimization problem which needs advanced technology and approaches for obtaining solutions.

**2. Supply Contacts**

The supply contracts (which mentions the pricing and volume discounts, quality, delivery lead times, returns etc.) helps in the replacement of the traditional supply chain strategy with the strategy which optimizes the performance of complete supply chain.

The various pricing strategies such as volume discount and revenue sharing contracts which are adopted by the suppliers for encouraging the buyers to place more orders helps in increasing their profile.

**3. Product Design**

Supply chain is significantly influenced by the product design. Some product designs may enhance inventory holding or transportation costs while others may help in reducing the manufacturing lead time.

But the cost of designing is very high. So, it should be designed at an appropriate time so as to decrease the cost of logistics or supply chain lead times. The changes to be made in supply chain should be ascertained for exploring the new product design.

**4. Inventory Control**

Generally a retailer maintains a specific inventory level so as to meet the changing demands of customers. The retailer anticipates the demand based on the past data. The basic aim of the retailer is to ascertain when to reorder for a new batch of the product and how much to order, so as to minimize the inventory ordering and holding costs.

The retailer holds a specific amount of inventory for various reasons like uncertainty in the customer demand, uncertainty in the supply process, etc.

The retailer has to decide about the quantity to be ordered, (i.e. more than, less than or exactly same as he anticipated demand) and also the inventory turn over ratio.

**5. Outsourcing and Procurement Strategies**

The firms while formulating its supply chain strategy needs to consider the following aspects:

- (i) Integration of various activities in the supply chain.
- (ii) The products which need to be manufactured internally.
- (iii) The products which need to be bought from outside sources.

The firms should recognize the manufacturing activities which are lying in its set of core competencies and must complete its internal activities.

The firm should also decide about the products and services which need to be outsourced, when to outsource and the risks associated with it.

The effect of Internet on procurement strategies should also decide how to deal with the trading partners i.e., whether through the public exchange or private exchange.

**6. Customer Value**

The customer value has succeeded over the measures like quality and customer satisfaction, as it measures the contribution made by a company to its customer on the basis of the whole range of products, services, intangibles, etc.

The supply chain management of a firm would be effective if it satisfies the customer needs and offer them the value and provides answers to various questions like,

- (a) How to ascertain the customer value in various industries and how it is measured
- (b) How the information technology improves the customer value in supply chain and how does it (supply chain) contributes towards the customer value.

**7. Supply Chain Integration and Strategic Partnering**

The need for the companies to integrate their supply chains and involve in strategic partnering arise from their customers as well as from their supply chain partners. This integration can be attained effectively when the information is shared and the operations are planned. However, the companies should be clear about the type of information to be shared and used, the influence of information on the design and operation of supply chain, etc.

**8. Information Technology and Decision-Support System**

Information technology acts as a key enabler of effective supply chain management due to the availability of the vast data and the saving attained by the comprehensive evaluation of these data. The various issues related to information technology in SCM are,

- (a) Transferring and ignoring the data which is important for SCM
- (b) Role of e-commerce
- (c) Infrastructure needed internally and also between the supply chain partners
- (d) Reasons for considering the information technology and decision support systems as the significant tools in attaining competitive advantage in the market

**Q13. Explain briefly about the various challenges faced by the firm in efficient management of supply chain****Answer :**

While developing and sustaining an efficient supply chain, the firms have to tackle various challenges issues. Some of them are,

**1. Supply Chain Networks**

Due to the rapid changes occurring in the marketing environment, the firms need to have a capable and flexible network system which can be suitable under any circumstance both in short as well as in long run. However in real-based situation, implementation of such networks is a very difficult task.

**2. Complexity**

In today's competitive era, every firm is expanding its scale of operations by penetrating the global/overseas market. But these globalized operations make the network of supply chain more complex by including a wide range of individuals. Furthermore, customer-supplier locations, transportation requirements, trade regulations, taxes, Stock Keeping Units (SKUs) increase complexity in SCM. The rapid expansion of SKUs can be hindered by rationalizing them based on their extent of contributions to the overall profitability such that slow movers or unnecessary intermediate items which do not have impact on profitability can be eliminated. In the same manner locations and suppliers/vendors need to be rationalized to reduce high operating costs. Even though development of complexity in supply chain is a usual phenomena but what organisations need to do is to evaluate these complexities on a regular basis, so that they can be reduced to a large extent.

**3. Inventory Deployment**

In supply chains, duplication of inventory along the supply chain leads to 'Bull whip effect', which can be reduced by maintaining effective coordination or integration between supply chain activities. Hence, inventory needs to be effectively deployed as it helps in reducing cost and increasing efficiency of operations.

**4. Information**

Firms are using technology and communication systems for the collection of information. However, this collected data is useless, unless it is effectively used in making decisions regarding inventory, customer service locations, transportations etc. In this aspect, the major challenge faced by the firms is to accurately share the collected data among all the parties of supply chain and to integrate such data in an efficient manner, so as to make them available to all the parties of supply chain.

**5. Cost/Value**

It is one of the major problems faced by the firm in global SCM, where firms are competing with each other by producing quality or value-added products at low cost than their competitor's offerings.

**6. Organizational Relationships**

As SCM is an integrated network of activities performed by producers, suppliers, customers, transportation agents, distributors, retailers etc. Collaboration is very much important for its operations. Both internal and external cooperation is facilitated by effective process of communication across the supply chain.

**7. Performance Measurement**

Most of the organizations set performance targets or metrics which helps them in analyzing their progress over different time frames. Sometimes, these measures act as performance objectives which firms need to achieve. The biggest challenge in this aspect is that firms need to recognize the lower level metrics that help them to achieve increased performance levels in the supply chains.

**8. Technology**

In today's competitive era, every organization wants to become an industry leader which forces them to spend huge amount on technology which helps in producing desirable product at low cost. Now, the challenge for any firm is to appropriately select, evaluate and successfully implement that particular technology which brings desirable improvements to the firm.

**9. Transportation Management**

The main objective of a firm's supply chain is to deliver the right product, at the right time, in the right quantity and quality, at the right cost and to the right destination. In order to realize this objective, transportation plays an important role.

**10. Supply Chain Security**

Traditionally, safe and on-time delivery of products to customers was the main function of supply chain, but it acts as a major issue in the present scenario due to increased risk of interruptions or shutdowns of supply chains. Even terrorist attack is an unexpected threat for any organization which establishes the need of scenario analysis, through which possible threats and environmental situations can be identified. Based on the results of scenario analysis, a firm plans for suitable alternatives.

**1.4 GLOBAL SUPPLY CHAIN MANAGEMENT**

**Q14. Define global SCM. Discuss various marketing strategies involved in global SCM.**

**Answer :**

**Global Supply Chain Management**

In today's business era, "globalization is found to be offering many opportunities and challenges for both logistics and supply chain operations. Firms are expanding globally with an intention of minimizing costs. In such a competitive environment, success can be achieved by identifying opportunities with the help of two vectors namely, cost led productivity vector and customer-led market-led vector. These opportunities include market expansion, product differentiations, human and material resources advantages. However, it should be noted that some regions of the world enable the firm to achieve significant economies of scale due to their competitive wage scales, while other requires expertise due to significant flexibility in those regions.

**Different Marketing Strategies in Global SCM/ Global Strategies**

Following are the various marketing strategies adopted by the firm while operating globally.

**(a) Export Marketing**

It includes all those activities of a firm responsible for producing and transporting the products beyond its domestic boundaries.

**(b) International Marketing**

It includes all those activities that enables the firm to get involved in the local marketing environment. It provides wider scope than export marketing. In different markets, firm designs different strategies that are highly specific by blending the cultural, economic and political values of the countries in which the firm is operating.

**(c) Multinational Marketing**

In this strategy, firm establishes subsidiaries in host countries where each market is managed and operated by their own human resources. These subsidiaries function as local firms with specific strategies and some degree of localization. Sometimes, it may lead to resource duplication, consequently reduce optimal effectiveness which is a costly affair.

**(d) Multi-regional Marketing**

It provides an opportunity to gain economies of scope by developing regional and integrated strategies. Due to the development in European Union, North American Free Trade Area (NAFTA) and the Pacific rim countries, the firm is forced to operate in a single region rather than operating in group of countries.

**(e) Global Marketing Strategy**

A global marketing strategy is a unique strategy that differs from other strategies by their ability to formulate a single strategy for a product/service which can be applied to all customer segments and under all market situations. In case of a global marketing strategy, the exporting company can manufacture and distribute from its domestic base while others design separate manufacturing and logistics facilities for separate territories.

**Q15. Define global SC strategy. How do you manage global supply chains?**

**Answer :**

**Global Supply Chain Strategy**

A global supply chain strategy acts as an effective tool in expanding the business by combining the objectives of various firms located in different countries, thereby helps in reducing the risk and increasing the profitability of firms.

**Managing the Global Supply Chain**

A firm can adopt any one of the following methods for overseas global expansion.

**(a) Exporting as an Entry Option**

It provides opportunities for the firms who wish to expand their scale of operations without investing heavily on fixed and current assets. Growth rate maturity volumes are the driving forces for the implementation of an effective supply chain system. Exporting strategy may be direct or indirect. Indirect exporting strategy is characterized by low investment requirement where domestic-based intermediaries can be used for selling the firm's products, as they possess knowledge and expertise required to operate in such markets.

The supply chain management issues can be resolved by offering reliable service to the ultimate customers.

**(b) Company Owned Sales Subsidiary**

In this method, company manages the sales operations by assuming the roles of the distributor which involves stocking of products, selling them and assumes payment risk, as it is associated with huge capital that has to be invested to finance capital and customer credit. Company makes use of third party for both storage and transportation activities.

**(c) Licensing**

A number of companies who want to explore the global market segments make use of licensing operations, where a local firm gives permission to a subsidiary or other company to use its operations in return of a specific amount without investing much in current or fixed assets. Even though, licensing provides various advantages to the licensor, it is also disadvantageous, as licensee may become its competitor in the near future, lacks control on products and services, may result in quality distortions leading to bad reputation to the licensor. Such possibilities can be controlled by stipulating a licensing period within which, no license is allowed to produce/practise the same products/processes as that of licensor.

**(d) Franchising**

Franchising is a special type of licensing, wherein franchiser is not only responsible for providing marketing and operations management programmes, but also provides inputs of the processes so that a franchiser must have a "bird's eye approach" on the entire operating mechanism of a franchisee. For example, McDonald's became an integral part of an extended supply chain management task to ensure that quality service is delivered which is as per their requirements.

**(e) Local Manufacturing**

Local manufacturing provides marketing opportunities for foreign companies who are engaged in producing and marketing their own products in overseas market.

Local manufacturing provides different manufacturing alternatives. Some important alternatives are

**(i) Contract Manufacturing**

In this alternative even though local firm delegates its production operations with the local companies to meet specific volume requirements, the marketing function rests with the principal firm (supply chain function). Contract manufacturing is applicable for the countries who have low-volume requirements with high tariff rates which does not require any initial investment for building and operating a manufacturing outlet. Contract manufacturing plays a significant role in the efficient management of supply chains. It mainly requires efficient inventory management programme for the markets which have to be serviced by the manufacturing base. However, a perfect blend of such service programmes along with the effective transportation mode enables the firm to maximize its economies of scale.

**(ii) Assembly Operations**

This type of alternative is found to be applicable where the whole manufacturing process is a costly affair. It usually helps in reducing the burden of initial capital investment of the local firm. It provides cost advantages from labour savings by achieving economies of scale and experience. This efficiency can be enhanced by transporting products required for assembly in the form of kits. This is a useful operation approach for automobile manufacturers.

**(iii) Fully Integrated Production**

It is associated with initial capital investment and commitment to the regional markets. All such decisions mainly depend on market potential and market support infrastructure.

**Q16. Explain the significance of global supply chain management.**

**Answer :** (Model Paper-II, Q6(a) | May/June-12, Q2(a))

Globalization of business operations is one of the latest emerging trend of the present competitive world. Business organizations are competing with each other at their level, best at the global context by offering improved, qualitative and innovative products to the worldwide consumers. The firms are making an entry into international markets in order to just grab and make use of the growing opportunities and also to develop an association with the foreign suppliers for making the sourcing operations more profitable. It was being observed that from the year 1954 to 1995 there was a drastic increase in the FDI from \$ 108 billion to \$ 5 trillion. FDI has grown much faster/steadier than the world trade. The thrust of entering foreign markets and making use of the foreign supply of firms has increased even more presently. As a result, large number of firms are entering into the international markets in order to attract and reach the global consumers by making use of the strategic operations and effective supply chain management.

Just-In-Time (JIT) and Quick Response (QR) inventory management policies, business re-engineering and so on are some of the important tools which are being used by the firms to carry out the global operations.

Firms which desires to function in the global markets needs to have clear understanding of the issues and opportunities of supply chain management prevailing in the markets. Basically, cultural, political and economic factors are the most significant factors which effects the global operations. An effective Global Supply Chain Management (GSCM) would help the firms in minimizing their costs i.e., (fixed, variable, inventory, distribution, taxes duties and other related costs, and distribution time also. One of the best examples of an effective GSCM is the GSCM of DEC's company. The GSCM helped the company to reduce the manufacturing and logistics cost by more than \$ 367 million. The GSCM also helped the company to continuously increase their profits as well as it also managed the operations of 32 manufacturing units in 12 manufacturing units.

The strategies of Global Supply Chain Management (GSCM) basically differs from one firm to another firm on the basis of their historical evolution and strategic objectives. A multinational company, an international company, global firm and transnational firm usually follows different strategies of GSCM with unique objective of globalization. A multinational company would be able to get the benefit, if it uses the GSCM strategy of the comparative analysis. The GSCM offers "knowledge transfer across cultures" strategy to international firm, where as it offers "network optimization, operating flexibility and environmental scanning" strategies to global firms.

The firms usually need different degree of supply chain integration, supply chain structure and various strategies, to carry out the business with the international customers. They also face various issues, complexities and high degree of risk involved in the global environment. As the extent of business operations increases, the amount of risk, uncertainties and complexities also increases. One could imagine the degree of risk and uncertainties which are involved in the global operations. Marketers state that an effective global supply chain management would lead the firms in minimizing risk and uncertainties to a great extent, optimize their operations, reduce costs and maximize profits. It gives the best solutions to issues taking place due to change in culture, infrastructure, industry structure and legal requirements of various nations. From the financial perspective, it helps the firms in managing various accounting systems. Comparability of data, counter trade and foreign exchange risk.

The professionals of GSCM make firms easy to cooperate and transact well with the people belonging to different languages and cultures. GSCM also ensures a consistent flow of knowledge and information across the national borders. It basically concentrates upon the concept of "what if", for handling the challenges of global environment. The best GSCM planning would make the firms enjoy supernormal profits worldwide.

Transferring knowledge and resources play a vital role in global operations of a firm. Firms are supposed to transfer knowledge and resources from cooperate head quarters to various other country branches and must develop skills and capabilities in the worldwide units and branches.

#### 1.4.1 Risks in Global SCM – Differences Between Domestic and Global SCM

**Q17. "In global SCM, firms have to face different types of risks" Elucidate.**

**Answer :**

As global SCM involves the different individuals belonging to different regions, they differ from each other in culture, core values, policies, political norms and government regulations which may act as obstacles in the operations of global supply chain. Hence, these factors need to be regulated in an effective manner for the implementation of global supply chain strategy. Some of the important risks involved in global SCM are as follows,

##### 1. Political Environment

Due to dynamic political philosophy and stability, potential risk emerges. Certain philosophies of a host country may be extreme from business point of view. Government regulations of home country may be different from host country. Certain policies which may act as regulatory frameworks in home country can become illegal practices in host country. Such factors need critical analysis for the success of business operating globally, as these political ideologies have an influence on the supply chain infrastructure.

##### 2. Host Government Regulations

Certain government regulations are found to be favorable for the establishment of an overseas supply chain. Government regulations are changing depending on the changes in external environment, out of which some of them are favorable for the guest country while others act as inhibiting factors.

Following are some of the government actions undertaken by the host countries.

**(a) Buy Local Restrictions**

"Buy local" restrictions are imposed by the government of host country. According to which, all guest firms must make use of significant proportion of inputs from local suppliers in their manufacturing processes, which is a costly process as firms are unaware about the quality and texture of inputs supplied by the local suppliers. Even, sometimes the entire business process may go in vain if the inputs are not of desirable quality.

**(b) Non-tariff Barriers**

Non-tariff barriers are restrictive trade practices adopted by the host firms on the free flow of goods and services across their political boundaries. These barriers have a drastic impact on the production and sales of the firms.

Example: Trade quotas

**(c) Subsidies**

Establishment of subsidies may hold both positive and negative impact for the foreign companies. Positive subsidies increases employment opportunities and facilitates foreign exchange, which increases the GNP of the host country. On contrary to this, negative subsidies inhibit guest company from its expansion by protecting the local companies from the competition of MNC's.

**(d) Operating Conditions**

Host government holds control on the operating conditions of the firms which involves control on working hours of labour, promotional and sales activities etc.

However, if such controls are equally applicable to both domestic and international firms then such threats can be reduced. On the other hand, if unequal restrictions are practised for both the firms then international firms have to suffer losses due to operating inefficiencies.

**(e) Ownership Conditions**

As most of the countries impose restrictions on the incoming businesses, ownership conditions vary dramatically. Certain countries require complete local control over the operations of guest firms, while others consider it to be a difficult process to operate the business of guest company. Under such circumstances, firms operate in those countries until such regulations have been established.

**(f) Takeovers**

Takeovers are the usual practices wherein the host country government carries all the operations of an international firm by adopting the following practices.

**(i) Expropriation**

It is a method of acquiring the operations of the firm by paying certain amount as "compensation", but payment of compensation is not a mandatory requirement.

**(ii) Confiscation**

It is a special type of expropriation where acquisition of firms occur without compensations.

**(iii) Domestication**

It is a type of restrictive mechanism adopted by the government of host country, where specific activities of supply chains are confined to the domestic firms.

**3. Substantial Geographic Distances**

As global supply chain operates with different individuals situated distant from each other, it is associated with high lead times for transportation, risk of missing of components during shipments, high cost of inventories, production delays due to non-availability of raw materials etc., this all leads to a drastic issue known as 'bull-whip effect'.

**Bull Whip Effect**

It refers to a phenomenon where steady demand for a product transforms into fluctuating demands, while moving up in the supply chain from consumers to producers.

**4. Inaccurate Forecasting**

Increased geographical distances leads to forecasting difficulties. This occurs due to long geographical distances and also due to communication barriers existing between the individuals of host and home countries. Such that different languages, mentalities and culture of different people leads to different judgment which in turn influences demand forecastings.

**5. Fluctuations of Exchange Rates**

As global supply chain involve operations in different country any change in the exchange rate of a single firm may lead to the overall change in the profitability of a business. Effective risk management is required for global SCM.

**6. Infrastructural Inadequacies**

Developing countries are incapable of providing infrastructural facilities which makes it difficult for the firms to carryout their operations in such countries. Lack of skilled workers, absence of desirable suppliers, quality deficiencies in transportation and telecommunications infrastructure also inhibits global operations of SCM.

Each firm must have effective forecasting methods which enables them to predict the problem issues encountered by them while operating globally on a large scale, such that they can formulate suitable strategies to reduce the effect of such issues.

**Q18. Compare and contrast global SCM and domestic SCM.****Answer :**

Five major differences exist between domestic and global supply chain management are as follows.

**1. Performance Cycle Structure**

It is a major differentiator between domestic and global SCM. In domestic SCM, performance cycles are extended from 1-5 days to 2-10 days time duration, while this length is extended to weeks or even months in global SCM. The reasons behind the longer time duration of performance cycle may be due to communication delays, financial requirements, ocean freight scheduling, slow transit times and customer clearance processes. All these reasons increase the complexity and flexibility of global SCM than domestic SCM. Elaborated performance cycle in turn influences the asset commitment due to transit inventories, which moves from one place to another depending on their requirements.

**2. Transportation**

Global SCM differs from domestic SCM depending on the mode of transportation. In case of international operations firm uses following three different strategies.

**(a) Intermodal Ownership and Operation**

Traditionally, transportation of goods was facilitated by few steamship lines which makes the international operations a complex task as the international operations require multiple modes to perform a single freight movement. Services provided by the foreign-owned carriers are determined by the government. Marketing and establishment of strategic alliances among different partners belonging to different countries which helps in improving the transportation flexibility.

**(b) Privatization**

In domestic firms, government owned carriers are used to promote trade and to provide national security which is found to be an unfavourable mode of transportation for global firms as it is associated with high cost and low efficiencies. Hence, carrier privatization has been adopted to increase the efficiency of operations beyond the geographical boundaries.

**(c) Cabotage and Bilateral Service Agreements**

The cabotage is a term which is specifically used for the countries having exclusive rights for air traffic. In case of domestic SCM, cabotage laws force the firms to use only domestic carriers for the movement of goods or individuals, while such restrictions are absent in global SCM.

**3. Operational Considerations**

Global environment is characterized by unique set of operational considerations, which are as follows.

- (i) Domestic environment operations involve single language for both product description and documentation, whereas global SCM needs to deal with multiple languages where product description must be done in local language, which increases the time and efforts for international operations due to the translation of complex documents into local language. Such complexities can be reduced by using standardized electronic transactions.
- (ii) Certain features such as performance features, technical characteristics, environmental considerations and safety requirements are unique for the global firms.
- (iii) Third operating consideration involves variability of documentation used for international operations, whereas domestic operations are documented by using invoice and bill of lading.
- (iv) High incidence of counter trade and duty drawback is mostly seen in international operations, while such operations are not seen in domestic SCM.

**4. Integration of Information Systems**

Global SCM involves the integration of two types of information systems while they are absent in domestic SCM. The two information systems are:

- (i) Global transaction or ERP system (Enterprise Resource Planning system) and
- (ii) Global planning system.

ERP system provides common and consistent data to all global suppliers, customers and producers irrespective of their geographic locations, whereas global planning system plays an important role in maximizing the overall efficiency of manufacturing process required for achieving higher customer satisfaction.

**5. Alliances**

Formation of alliance in domestic operations is an important measure in achieving competitive advantage while the same is essential for global operations without which no enterprise is able to maintain relationship with suppliers, manufacturers, wholesalers and retailers, which is an important step in international SCM.

**6. Area of Coverage**

In domestic SCM operations are restricted only to geographical/national boundaries, while in global SCM this coverage is extended across the national boundaries by forming relationship with more than one country.

**7. Operating Cost**

As global SCM involves operations at global level, it is found to have more operating cost than domestic SCM, as it has to produce finished goods in large volumes, need to travel long distances and must produce wide range of products to meet the demands of global customers.

**8. Customization**

Process of customization is absent in domestic supply chain, whereas international SCM is mainly responsible for producing customized products depending on the requirements of different customers belonging to different geographical locations.

**9. Exchange Transactions**

Global SCM involves transactions in multiple currencies and is more prone to exchange risk, while this is not seen in domestic SCM as it carries/values all the transactions in its local currency.

**10. Infrastructural Facilities**

Domestic supply chain possesses good and effective infrastructural facilities due to its limited scope of operations, whereas such infrastructural facilities are absent in global supply chains due to the expansion and diversification of the focal firms, which causes network complexities.

**1.5 VALUE CHAIN AND VALUE DELIVERY SYSTEM FOR SCM**

**Q19. Explain the concept of value chain and value delivery system for SCM.**

**Answer :**

(Model Paper-I, Q6(b) May-14, Q2(a))

**Value Chain Analysis**

The value chain is a type of supply chain wherein the relationships and interdependencies between the suppliers, buyers, intermediaries and customers can be identified. The main purpose of value chain analysis is to identify the 'value' that has to be created for customers which acts as a major source of achieving competitive advantage. 'Value' is the networth of disposable income spent by the individuals in acquiring firm's goods/services.

'Value' may be exemplified by the form of selling core or undifferentiated product at a price generally less than the competitors' price. Value may also be referred to a form of unique benefits acquired by the customers in return of premium pricing.

The 'value chain analysis' may be defined as the way of analyzing the activities of not only focal firms but also their counterparties within an overall supply chain, so as to ensure that value has been delivered to the customers. Such value may be in the form of quality goods/services, low price, products with desirable features, durability, flexibility etc.

Usually, value may be defined as quality, exclusivity, convenience or service response of customers. Total cost associated with a product or service is shown in the figure.

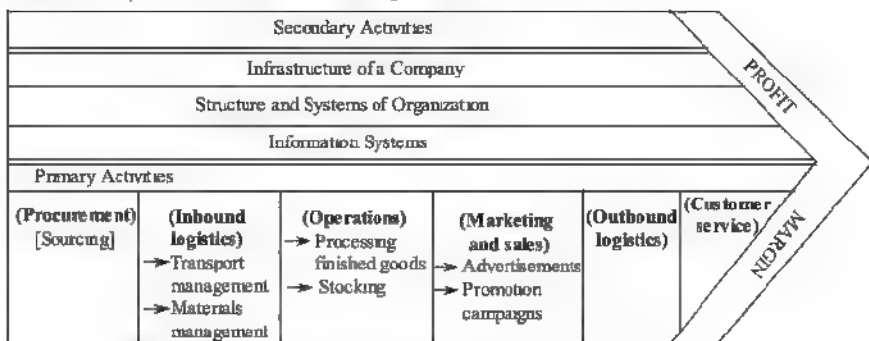


Figure: A Logistic View of the Value Chain

The "total customer cost" is an aggregate of cost of the products along with additional costs which the firm has to incur in delivering them to the ultimate customers. These additional costs may be transportation cost, logistic cost, cost of holding stocks etc. While deriving the total cost of a product, all the associated costs along with the total benefits or value acquired from the products/services need to be considered.

The concept of value chain can be extended to a "value delivery system" by emphasizing the expectations of customers regarding the value of products or services.

Value delivered to a customer is a function of three features:

1. Width, depth and availability of products
2. The order administration and delivery process
3. A customer service process

These three functional elements are described in the following figure.

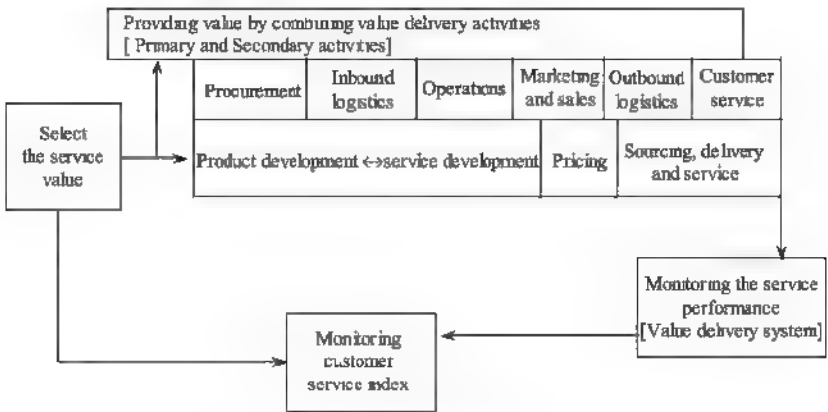


Figure: Combining Value Chain with Value Delivery System

### Functioning of an Integrated Concept

The primary activities of value chain are combined to form various combinations of products/services that are helpful in fulfilling the demands of both individual customers and customer segments. After producing goods, the next step is packaging which involves two important tasks of pricing and sourcing. Pricing represents the total value for both suppliers and customers, while sourcing refers to all those activities involved in producing tangible products and intangible services that differentiates the core tangible elements (inputs) from the final value-added products/services.

Even, latest information systems, like EDI (Electronic Data Interchange) plays a very important role in adding value to the inputs of supply chain. EDI provides the following advantages to,

1. Improvement in the productivity of logistics
2. Rapid and accurate flow of informations
3. Improved cash flows
4. Reduced forecasting errors
5. Improved leading linkages

In order to perform efficiently, EDI requires accurate EPOS (Electronic Point Of Sale) data, which enables it for the effective management of production operations and inventory allocations.

**Benefits**

Following are the benefits of value chain in supply chain

1. It helps in the identification of all those roles and activities that needs to be performed for achieving customer satisfaction
2. Through value-chain analysis, critical activities can be determined which helps the firm in reducing the overall cost by eliminating the intermediaries that are responsible for increasing the overall cost of supply chain
3. Activity based costing is used to determine the accurate costs of the process

**Value-Delivery System for SCM**

For answer refer Unit I, Page No. 120. Q No. 20

**Q20. How do you develop a value-based or value delivery system of supply chain?****Answer :**

The main objective of value-based or value delivery system of supply chain is to maintain a proper balance between the service requirements and the flow of materials from the suppliers to the firm, such that the conflicting goals of high customer service, low inventory and operating costs can be optimized

Stevens (1989) developed a balanced supply chain model, which involves functional trade-off between its various activities as shown in the figure

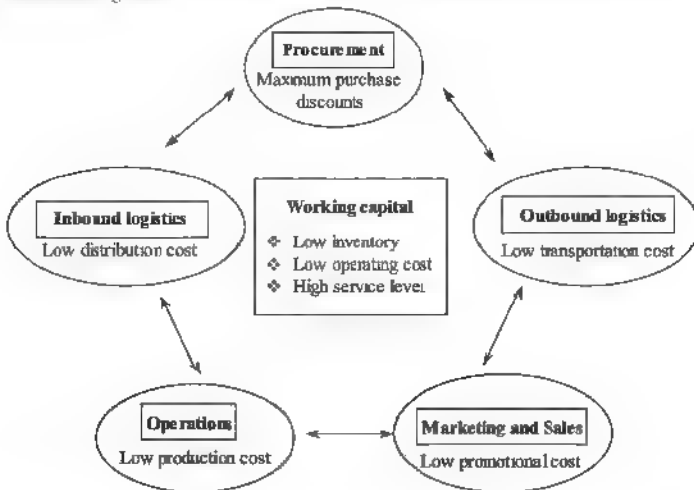


Figure: Balanced Supply Chain Model

The development of an integrated supply chain involves the management of materials and information at three different levels of the firm. They are strategic, tactical and operational level

According to Stevens, at strategic level, firms must focus on,

1. Objectives and policies of supply chain
2. Physical components of supply chain like raw materials, machines, labours etc
3. Statement of customer service intent developed by producers, customers and other parties of supply chain
4. An organization structure providing infrastructure for the establishment of an integrated value-based supply chain

At the tactical level, firm identifies different methods by which strategical aspects can be achieved. It mainly deals with identifying all those resources required for maintaining balance between the activities of supply chain

At an operational level, firms are mainly concerned with the efficiency of operations in terms of inventory costs, service levels, economies of scale and cost performances.

**Process**

Three stage process must be adopted for the development of balanced approach,

1. Evaluation of competitive environment
2. Diagnostic review of supply chain and
3. Development of an integrated supply chain

Each step can be dealt in detail as follows

**1. Evaluation of Competitive Environment**

This step involves the detailed analysis of an environment. It mainly deals with the analysis of service results of both focal firm and its competitors in terms of customer service characteristics i.e., a comparison is done between the service characteristics provided by both focal firms and their competitors. Finally, firms select only those characteristics that are found to be suitable for achieving competitive advantage.

**2. Diagnostic Review of a Supply Chain**

This step involves the determination of costs associated with various activities of supply chain with the help of a cost model. This model also plays a pivotal role in allocating various overhead costs to products, market segments and customers.

**3. Development of an Integrated Supply Chain**

It involves the development of supply chain strategy and implementation plans that are required for the establishment of an integrated supply chain. The strategy must be examined to ensure that the customer service expectations must be consistent with management's perception. While implementation plans are helpful for resource allocation throughout the supply chain, value-based supply chain can be developed by adopting both top-down and bottom-up approach.

The value chain approach of SCM enables the company to respond to market changes. In order to achieve competitive position in the market, firms must identify relationships between the component parts of supply chain. Based on such relationships, an integrated model of supply chain can be developed which helps in ensuring the cost effective management of consumer products and service expectations.

**1.6 BULL-WHIP EFFECT****Q21. Explain the concept of bull-whip effect in SCM**

**Answer :**

*Model Paper-II, Q6(b)*

**Bull-whip Effect**

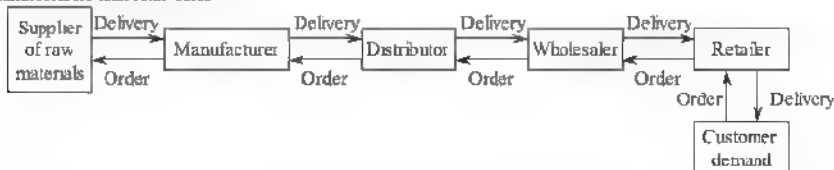
The phenomenon of increase in the demand or order variability across the supply chain while moving upwards i.e., from customers to manufacturers is termed as "bull-whip effect".

**Explanation**

In case of products with stable demand the retail sales will remain constant but there has been an increase in fluctuations in order quantities placed by distributors and wholesalers and manufacturers which resulted in increase in inventory and back order levels in a supply chain.

**Example**

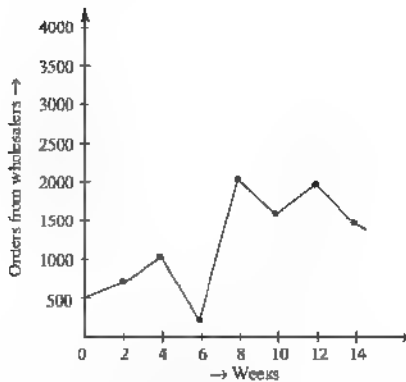
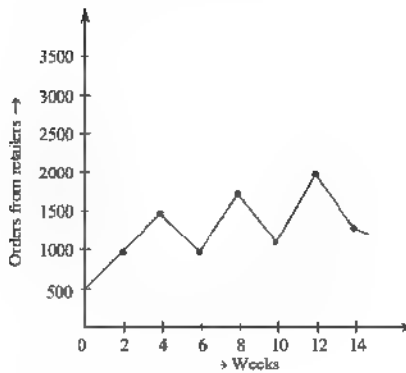
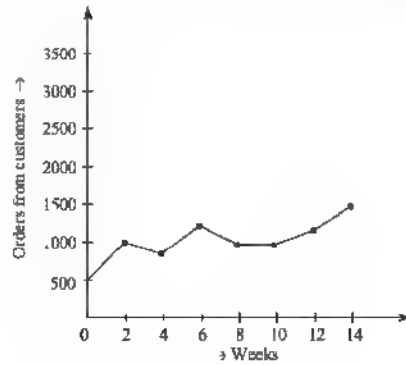
Phenomenon of bull-whip effect can be better understood by studying the demand fluctuation for nappies of "procter and gamble". These products have stable demand and have high fluctuations in orders from distributors, wholesalers and manufacturers than retail sales.

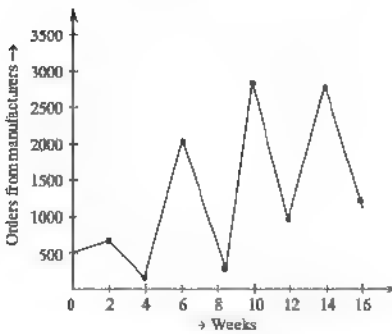
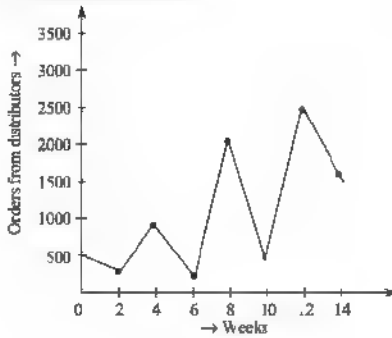


**Figure: Simple Supply Chain**

In this supply chain, the retailer places an order to the wholesalers for the products based on the demand forecasts. Wholesaler then places an order to distributors who in turn receive goods from the manufacturer. The orders placed by different supply chain members in relation with time is being represented in a graphical form as follows,

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The variations in the orders placed by wholesalers are higher than that of by retailers, that means wholesalers need to manage higher levels of inventory than retailers. Similarly, the inventory levels which are to be maintained by the remaining supply chain members is still higher than the wholesalers.

Demand fluctuations caused due to bull-whip effect may result in increasing inventory costs and wastage of firms resources.

#### Q22. Discuss various factors influencing Bull-Whip Effect

**Answer :**

The following are the factors which are responsible for the increase in variability in supply chain or bull-whip effect,

- Demand forecasting
- Increased lead times
- Batch ordering
- Price fluctuations
- Inflated orders.

#### (a) Demand Forecasting

The phenomenon of bull-whip effect is caused due to the use of traditional inventory management methods. Firms always use inventory control techniques mostly periodic review policy. In this policy, warehouses need to ascertain the target inventory level, the base stock level by reviewing the inventory position periodically. On the basis of such reviews, the warehouses can place an order for maintaining the base-stock level. The base stock level should be maintained equal to the demand required in leadtime and review period. Safety stock should also be maintained to reduce the bottlenecks in supply.

Base stock level and safety stock can be determined by estimating average demand and demand variations across the supply chain using standard forecast smoothing techniques. These estimates drives the warehouse manager to vary the order quantities which results in bull-whip effect

#### (b) Lead Time

The demand variability increases with an increase in lead time, as the lead times has significant impact on the level of safety stock and base stock estimations.

$$\text{Safety stock/Base stock level} = (L + r) \times \sigma_{ed} \times \sqrt{r + L}$$

$L$  = Lead time

$r$  = Review period

$\sigma_{ed}$  = Standard deviation of consumer demand

Any increase in lead time would result in the change in safety stock and base stock level, which further results in variations in order quantities. These variations ultimately results in the bull-whip effect

#### (c) Batch Ordering

Batch ordering has a significant impact on increase in variability in order quantities. If a retailer follow (Q, R) policy i.e., batch order policy then he would place a bulk order to the wholesalers and sees that he does not place any order for several periods. Again after sometime he would place a bulk order and so on. This pattern would result in significant fluctuations in the order quantities which are placed to the wholesalers

Firms often make use of batch ordering because of the following reasons.

- ❖ To reduce the order costs
- ❖ To reduce the transportation costs
- ❖ To avail the discounts for making bulk purchases.

#### (d) Price Fluctuations

Fluctuations in price also affects the demand variations. In order to sustain the price fluctuations most of the retailers place orders in bulk when the prices are low. Whereas in the normal times they will place standard orders only to that they do not incur much greater losses

#### (e) Inflated Orders

Sometimes, retailers would go for the inflated orders for the products which are scarce in nature. After this period retailers will place standard orders. These changes in order quantities due to shortage of supply would lead to variations in demand estimates which further results in bull-whip effect

#### Q23. How do you quantify the bull-whip effect?

**Answer :**

In order to regulate the impact of bull whip effect it is necessary to measure the increase in variability in demand at each stage of supply chain. Quantification of bull-whip effect not only measures the increase in demand variability but also the relationship between the factors influencing the bull-whip effect

The demand variations can be measured by taking into consideration the single supply chain with retailers, manufacturer and customer with a fixed lead time 'L'. Retailer can get the order at  $(t + L)$  period that is placed at 't' period. If incase the firm implements a simple periodic review policy then it needs to maintain target inventory or base stock level by reviewing it on the periodical basis.

$$\text{Base stock level } S = \text{Avg} \times L + Z \times \text{STD} \times \sqrt{L} \quad (1)$$

Where,

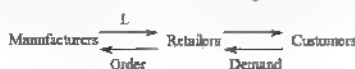
Avg = Average forecasted demand

STD = Standard deviation of demand during the lead time

Z = Safety factor

L = Lead time

Base stock level should be maintained in warehouse for meeting the demand.



In this case retailer would be able to make an estimation of the Avg and STD on the basis of the observed demand. These values change from period to period and needs to be updated which would affect the order upto point (3.)

$$y_t = \mu_t L + \sigma \sqrt{S L} \quad (3)$$

Where

$\mu_t$  = Average demand estimate

$\sigma_t$  = Standard deviation of customer demand at period 't'

If the retailer is using moving average method of demand forecasting, then one has to estimate the mean and standard deviation for 'n' observations of demand with the help of the following formulas

$$\mu = \frac{\sum_{i=1}^n D_i}{n} \quad (4)$$

$$S_t = \frac{\sum_{i=1}^n (D_i - \mu_t)^2}{n-1} \quad (5)$$

Where,  $D_t$  = Observed demand at period 't'

These estimates  $\mu$  and  $\sigma$  needs to be updated from period to period by taking into consideration the recent observations. These changes in estimates leads to a change in base stock level of retailer. The bull-whip effect can be given as the ratio of retail order to manufacturers ( $Q$ ) and demand from customers ( $D$ ). It can be determined using

$$\frac{\text{Var}(Q)}{\text{Var}(D)} \geq 1 + \frac{2L}{n} + \frac{2L^2}{n^2} \quad \dots (2)$$

Where

$\text{Var}(Q)$  = Variability in orders by retailer to manufacturer

$\text{Var}(D)$  = Variability in customer demand

L = Lead time

n = Number of observations of demand

### Example

If the lead time in a supply chain is '1' and number of observations are 6 then the increase in variability is given as

$$\frac{\text{Var}(Q)}{\text{Var}(D)} \geq 1 + \frac{2(1)}{6} + \frac{2(1)^2}{36}$$

$$\frac{\text{Var}(Q)}{\text{Var}(D)} \geq 1.35$$

Suppose, if the number of observations have increased to 8 and the lead time has also increased from 1 to 3 ( $L = 3$ ) then the increase in variability is given as,

$$\frac{\text{Var}(Q)}{\text{Var}(D)} \geq 2.03$$

This shows that degree of variability will increase with an increase in lead time and a decrease in number of observations. Thus, a retailer can reduce the demand variance by number of observations of demand.

**Q24. Write the impact of centralized information on bull-whip effect.**

**Answer :**

Firm can reduce the bull-whip effect by centralizing the demand information in the supply chain with respect to the customer demand pattern. Centralization of demand information helps all the supply chain members to forecast their orders on the basis of the real customer demand data rather than taking into consideration the orders placed by the proceeding supply chain members. In order to ascertain the impact of centralization of demand information on reducing bull-whip effect. The supply chain is to be distinguished into two types, one supply chain with centralized information and another supply chain with demand information.

**1. Supply Chain with Centralized Information**

In this type of supply chain, the centralized supply chain or the retailer or the first stage in the supply chain identifies the customer demand, predicts the average demand and variance with the help of a moving average with  $P$  demand observations. Identifies the target inventory level on the basis of the forecast average and variance of demand and places an order to wholesaler.

The wholesaler or the second stage of the supply chain receives an order along with the retailer's forecast information. And makes use of this forecast to ascertain the target inventory level, and then place an order to the distributor. In the same manner the distributor or the third stage of the supply chain would receive an order along with the retailer's forecast demand, making use of this forecast would help in ascertaining the target inventory level and place an order to the fourth stage of the supply chain, the factory.

In a centralized supply chain, each stage of the supply chain receives the forecast of the retailer's mean demand and implements a base-stock inventory policy on the basis of the mean demand. Wholesaler can order upto the level, which is based on the forecasted demand information from retailer. In this case all the stages of supply chain has same inventory policy, pricing structures, forecasting techniques and so on, which would reduce the variables in demand.

$$\frac{\text{Var}(Q^P)}{\text{Var}(D)} \geq 1 + \frac{2 \sum_{k=1}^P L_k}{n} + \frac{2 \left( \sum_{k=1}^P L_k \right)^2}{n^2} \quad (1)$$

Where,  $P^{\text{th}}$  stage of the supply chain,

$K$  = Stage of the supply chain

$L_k$  = Lead time between stage  $K$  and  $K + 1$

If the lead time at each stage of supply chain is 2 periods, then the total lead time for the four stage supply chain will become 6 period ( $\because L_1 = 2, L_2 = 2, L_3 = 2$ )

$$L_1 + L_2 + L_3 = 6 \text{ periods}$$

From the above equation (1), it is clear that the variance in order at a given stage of supply chain is an increasing function of total lead time  $L_k$  between  $K$  and  $K + 1$ , i.e., retailer and the other stages of supply chain.

**2. Supply Chain with Decentralized Information**

In a supply chain with decentralized demand information, the estimates of mean and variance of retailer cannot be carried forward to the next stage of supply chain. The wholesaler needs to forecast their demand mean and variance with the help of the orders placed by the retailers. Suppose the firm follows the moving average method of demand forecasting for ' $n$ ' demand observations in order to ascertain the mean and variance of demand. Then on the basis of these estimates retailers can place order to the wholesalers. Further on the basis of the orders by retailers wholesalers are supposed to forecast the mean and variance of demand in order to determine the base stock level but not on the actual customer data and this continues to the other stages of supply chain.

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Order variance at  $P^{\text{th}}$  stage of supply chain is explained with the help of the following formula.

$$\frac{\text{Var}(Q^P)}{\text{Var}(D)} = \frac{P}{K-1} \left( 1 + \frac{2L_K}{n} + \frac{2L_A^2}{n} \right) \quad (2)$$

In centralized supply chain, variance is regarded as the increasing additive function of the total lead time while in case of decentralized supply chain, the order variance is the multiplicative function of the total lead time. Which results in an increase in variances at each stage of supply chain.

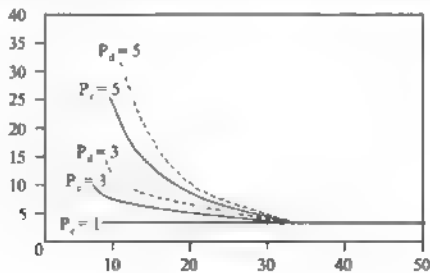
### Conclusion

From the above explanation it is quite clear that the variances in demand will increase with an upward movement along the supply chain towards the supplier.

The two stages of supply chain i.e.

- ◆ Centralized demand information and
- ◆ Decentralized demand information differs in degree of variability from one stage to another in supply chain. i.e. In centralized supply chain increase in variability is an additive function whereas in decentralized supply chain it is a multiplicative function.

The figure shows the difference in order variance in the two stages of supply chain.



Figure

Where,

$P$  = Stage of supply chain with centralized information

$P_d$  = Stage of supply chain with decentralized information

This shows that in comparison to the decentralized supply chain, centralized supply chain can help a firm in reducing the impact of bull-whip effect. Though in the centralized supply chain the inventory policies, forecasting methods are similar to the supply chain but still there exists bull-whip effect to some extent. Based on the above analysis it is clear that centralized supply chain can reduce the impact of bull-whip effect by reducing the order variances but cannot remove it completely.

**Q25. What are the various methods through which impact of bull-whip effect can be reduced?**

**Answer :**

The impact of bull whip effect on firm's operations can be reduced to a great extent use by making anyone of the following methods as follows.

- (a) Minimizing uncertainty
- (b) Minimizing variability of consumer demand
- (c) Minimization of lead times
- (d) Strategic partnerships

**(a) Minimizing Uncertainty**

Firm can reduce the bull-whip effect by reducing uncertainty with the help of supply chain by centralizing the demand information among all the supply chain members or at any stage of supply chain. Therefore, the firms can reduce uncertainty with the help of centralizing the demand information. The centralized data helps in the use of single inventory policy. Single forecasting method, pricing strategies and so on, there still exists bull-whip effect. Thus, it is clear that reducing uncertainty through centralization of information cannot eliminate the bull-whip effect but can reduce its impact greatly on the firm's operations.

**(b) Reducing Variability of Consumer Demand**

Firm can reduce the bull-whip effect by reducing the variations in the consumer demand process. Even though, the bull-whip effect reduces the variations in consumer demand it can also reduce the variations in demand at any stage of supply chain.

**Example**

A firm can reduce consumer demand variations using Every Day Low Price (EDLP) strategy i.e., maintaining low prices and reducing price promotions. This method can eliminate the variations in demand pattern which leads to maintaining consistent demand thereby reducing the bull-whip effect.

**(c) Minimization of Lead Time**

As mentioned earlier, lead time has a significant impact on demand estimation variability. Increase in lead time leads to significant increase in order quantity variability across the supply chain. Thus, firm should reduce the lead times in order to reduce the impact of bull-whip effect. Lead times can be reduced by managing its components such as:

- (i) Order lead time for shipment can be managed or reduced through cross-docking.
- (ii) Information lead time for order processing can be reduced through electronic data interchange.

**(d) Strategic Partnerships**

Strategic partnerships can reduce the impact of bull-whip effect on firm's operations. Strategic partnerships provide different ways of information sharing and inventory management across the supply chain which can reduce the demand variability.

**Example**

Firms by using Vendor Managed Inventory (VMI) can reduce the impact of bull-whip effect by managing the inventory based on their own estimates and demand forecasts but not on the retailer.

**SHORT QUESTIONS AND ANSWERS****Q1. Define Supply Chain and Supply Chain Management (SCM).****Answer :****Supply Chain**

According to Stock and Lambert, supply chain integrates the key business processes of an organization from end-user through original suppliers that provide products, services and information that add value for customers and other stakeholders

**Supply Chain Management (SCM)**

According to the Institute of Supply Chain Management, supply chain management is defined, as the design and management of seamless, value-added process across organizational boundaries which helps in meeting the real needs of the end-user

**Q2. Write about supply chain strategy and global supply chain.***Model Paper-I, Q1***OR****Supply Chain Strategy***(Refer Only Topic: Supply Chain Strategy)***Answer :***May/June-13, Q1(a)***Supply Chain Strategy**

Supply chain strategy is an iterative process, where firms are continuously engaged in evaluating the cost-benefit trade-offs of different operations

**Global Supply Chain**

Global supply chain is defined as the series of activities involving different facilities and functions that are used in the production of a product or service and then finally it is delivered to the customers, who are located in different geographical areas. It is usually made up of interrelated organizations, resources and processes.

**Q3. Functions of SCM****Answer :***(Model Paper-II, Q3 May/June-16, Q1(b))*

The main functions of supply chain management involves,

- (i) Building trust and collaboration among the partners of supply chain.
- (ii) Improving inventory visibility
- (iii) Reduces carrying cost of inventory etc

However, following are the three main activities involved in the process of supply chain management.

1. Strategic activities/functions
2. Tactical activities/functions
3. Operational activities/functions.

**Q4. Objectives of SCM****Answer :***April-15, Q1(a)*

The main objectives of Supply Chain Management (SCM) are as follows.

1. It aims to reduce uncertainty
2. It aims to reduce lead time
3. It aims to eliminate non-value added activities
4. It aims to enhance flexibility and helping in maintaining good quality

**Q5. Bullwhip Effect****Answer :***(Model Paper-III, Q5 | April-13, Q1(b) | June-17, Q1(b))*

The phenomenon of increase in the demand or order variability across the supply chain while moving upwards i.e. from customers to manufacturers is termed as “bull-whip effect”

In case of products with stable demand the retail sales will remain constant but there has been an increase in fluctuations in order quantities placed by distributors and wholesalers and manufacturers which resulted in increase in inventory and back order levels in a supply chain

**Example** Phenomenon of bull-whip effect can be better understood by studying the demand fluctuation for pampers of “proctor and gamble”. These products have stable demand and have high fluctuations in orders from distributors, wholesalers and manufacturers than retail sales

**Q6. Global SCM****Answer :***May-14, Q1(a)*

Global supply chain is defined as the series of activities involving different facilities and functions that are used in the production of a product or service and then finally it is delivered to the customers, who are located in different geographical areas. It is usually made up of interrelated organizations, resources and processes

In today's business era, “globalization is found to be offering many opportunities and challenges for both logistics and supply chain operations. Firms are expanding globally with an intention of minimizing costs. In such a competitive environment success can be achieved by identifying opportunities with the help of two vectors namely, cost-led productivity vector and customer-led market led vector. These opportunities include market expansion, product differentiations, human and material resources advantages. However, it should be noted that some regions of the world enable the firm to achieve significant economies of scale due to their competitive wage scales, while other requires expertise due to significant flexibility in those regions

**Q7. Optimization In SCM****Answer :***May/June-13, Q1(b)*

There exists different factors of production for carrying out any business activity. For example: Physical resources which includes land, building, machinery, inventory etc., financial resources consisting of cash, receivables, creditors, human resource involving management and employees, information resources comprising of data, hardware, software etc. All these resources have certain features which may be general or specific in nature. Optimization of resources implies making full use of the resources or using the resources to the fullest extent in order to achieve economies of scale. Thus in this modern era organizations are adapting optimization of resources in order to answer the queries of when, where, and how much resource should be allocated to each activity in order to achieve the present objectives

**Q8. Value Chain****Answer :***May/June-12, Q1(a)*

The value chain is a type of supply chain wherein the relationships and interdependencies between the suppliers, buyers, intermediaries and customers can be identified. The main purpose of value chain analysis is to identify the ‘value’ that has to be created for customers which acts as a major source of achieving competitive advantage. ‘Value’ is the networth of disposable income spent by the individuals in acquiring firm's goods/services

‘Value’ may be exemplified by the form of selling core or undifferentiated product at a price generally less than the competitors's price. Value may also be referred to a form of unique benefits acquired by the customers in return of premium pricing

The “value chain analysis” may be defined as the way of analyzing the activities of not only focal firms but also their counterparties within an overall supply chain, so as to ensure that value has been delivered to the customers. Such value may be in the form of quality goods/services, low price, products with desirable features, durability, flexibility etc.

**INTERNAL ASSESSMENT****I. Multiple Choice**

1. Which of them integrates the key business processes of an organization from end-user through original suppliers that provide products, services and information that adds value for customers and other stakeholders? [ ]
  - (a) Value chain
  - (b) Supply chain
  - (c) Logistics
  - (d) Distribution
2. What are the functions of supply chain? [ ]
  - (a) Reducing uncertainty
  - (b) Reducing lead time
  - (c) Both (a) and (b)
  - (d) None of the above
3. \_\_\_\_\_ acts as a network structure for sourcing of raw materials, manufacturing of products and distribution of those products to the customers. [ ]
  - (a) Product flow facility structure
  - (b) Information flow facility structure
  - (c) Work structure
  - (d) Management methods
4. Which factor affects the formulation of a supply chain strategy? [ ]
  - (a) Profitability
  - (b) Flexibility
  - (c) Consistency
  - (d) None of the above
5. The decision criteria for selection of places and location for in-house production is based on [ ]
  - (a) Cost of land
  - (b) Government subsidies
  - (c) Industrial and labour relations
  - (d) All of the above
6. Which one of the following does not constitute internal factors affecting demand? [ ]
  - (a) Product price
  - (b) Sales planning
  - (c) Promotional strategies
  - (d) Global competition

7. \_\_\_\_\_ is a process that follows capacity planning and uses medium range forecasting. [ ]
- Aggregate scheduling
  - Aggregate planning
  - Demand planning
  - Production planning
8. How is complexity in supply chain managed? [ ]
- Using correct metrics
  - Alignment of supply chain and product development
  - Limit and prioritize products
  - All of the above
9. Supply chain strategy is a \_\_\_\_\_ process. [ ]
- Interactive
  - Proactive
  - Reactive
  - None of the above
10. \_\_\_\_\_ focuses on a set of interrelated activities performed in a sequence for producing and marketing a product or service. [ ]
- Value chain
  - Value chain analysis
  - Value delivery system of supply chain
  - Modelling

## II. Fill in the Blanks

- The scope of supply chain management includes \_\_\_\_\_ and \_\_\_\_\_.
- The process of grouping of component parts of various stages of production is called as \_\_\_\_\_.
- \_\_\_\_\_ activities improve the value of the product and deals with customer support, repair services etc.
- \_\_\_\_\_ refers to distortion and uncertain in demand.
- The linkages or activities in which raw materials and goods flow from supplier to the firm and from manufacturer to the end customer are \_\_\_\_\_ and \_\_\_\_\_.
- \_\_\_\_\_ is defined as the series of activities involving different facilities and functions that are used in the production of a product or service and then finally it is delivered to the customers, who are located in different geographical areas.
- The primary and support activities were given by \_\_\_\_\_.
- The reason for complexity in supply chain is mainly due to \_\_\_\_\_.
- A process in which damaged or defective products are returned by the consumer are again processed is called as \_\_\_\_\_.
- A firm can manage supply by managing \_\_\_\_\_ and \_\_\_\_\_ to meet predictable variability.

**KEY****I. Multiple Choice**

1. (b)
2. (c)
3. (a)
4. (c)
5. (d)
6. (d)
7. (b)
8. (d)
9. (a)
10. (b)

**II. Fill in the Blanks**

1. Functional scope and organizational scope
2. Kitting of supplies
3. Service
4. "Bull whip effect"
5. Upstream and downstream linkages
6. Global supply chain
7. Michael Porter
8. Product proliferation
9. Reverse supply chain
10. Capacity and inventory levels

**III. Very Short Questions and Answers****Q1. Define Supply Chain Management.****Answer :**

According to the Institute of Supply Chain Management, supply chain management is defined, as the design and management of seamless, value-added process across organizational boundaries which helps in meeting the real needs of the end user

---

**Q2. Define Supply Chain.****Answer :**

According to Stock and Lambert, supply chain integrates the key business processes of an organization from end-user through original suppliers that provide products, services and information that add value for customers and other stakeholders

---

**Q3. What is Supply Chain Strategy?****Answer :**

Supply chain strategy is an iterative process, where firms are continuously engaged in evaluating the cost-benefit trade-offs of different operations

---

**Q4. Write about External Supply Chain****Answer :**

External supply chain involves all the efforts of the firm that have been put forward to maintain long-term relationships with external parties of supply chain, which involves suppliers, distributors, retailers, strategic alliances etc. In case of external supply chain, both materials and information flows from the firms to the end users

---

**Q5. Write about Internal Supply Chain.****Answer :**

Internal supply chain involves all those activities associated with the production process starting from the procurement of raw materials till the delivery of finished goods to the customers. Internal supply chain is characterized by transportation, materials-handling, equipment utilization and information systems facilities

---

**Q6. Define Global Supply Chain.****Answer :**

Global supply chain is defined as the series of activities involving different facilities and functions that are used in the production of a product or service and then finally it is delivered to the customers, who are located in different geographical areas. It is usually made up of interrelated organizations, resources and processes

---

**Q7. Value Chain Analysis.****Answer :**

Value chain analysis focuses on a set of interrelated activities performed in a sequence for producing and marketing a product or a service

The utility of value chain analysis for the purpose of operational and marketing evaluation lies in its ability to segregate the total tasks of a firm into identifiable activities which can then be evaluated for effectiveness

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**Q8. What is Bull Whip Effect?****Answer :**

Bull whip effect refers to a phenomenon, where steady demand for a product transforms into fluctuating demand while moving up in the supply chain from consumers to producers

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# UNIT 2

## Supply Chain Structure and Inventory in SC

### LEARNING OBJECTIVES

After studying this unit, one would be able to understand.

- ❖ The Concept of Logistics and Logistics Management
- ❖ Various Elements of Logistics Management
- ❖ Internal and External Environment of Logistics Management
- ❖ Concept of Integrated Logistics Management
- ❖ Concept and Elements of Inbound Logistics
- ❖ Concept and Elements of Outbound Logistics.
- ❖ Concept of Logistics Planning and Strategy
- ❖ Meaning, benefits and Process of Reverse Logistics
- ❖ Meaning of Inventory and Inventory Management
- ❖ Role of Inventory Management in Supply Chain and Customer Service

### INTRODUCTION

Logistics management is a wide term, applicable to both private and nonprofit public sectors. In 1960's, the concept of logistics management was appeared in business literature as "Physical distribution management" which was mainly responsible for the management of external environment of logistics system. But in modern era, the term has been changed to "logistics" as it mainly deals with all the activities that have an impact on making goods and services easily available to the customers.

Integrated logistics management is an approach to the distribution mission of the firm whereby two or more of the functions involved in moving goods from source to user are integrated and viewed as an inter-related system or sub-system for purposes of managerial planning, implementation and control.

Inbound logistics refers to all those activities that are found to be associated with the transfer of goods from the suppliers to the manufacturing plant, such that value-added goods can be delivered to the ultimate customers for their consumption. It is also termed as "physical distribution" management. It may be defined as the set of processes, systems and capabilities associated with the physical distribution of goods which enhances the firm's ability to serve its customers.

Reverse logistics is gaining a wide scope in a present scenario due to the endless generation of waste material whose recycling and reproducing plays a major role in increasing the profitability of a firm. Today, most of the firms are engaging themselves in reverse logistics activities.

As supply chain is associated with the flow of activities, information and materials required for producing and distributing output to the customers, it requires huge investment on plant and machinery, inventories which forming a major portion of firm's operating expenses. Inventory is considered as a major cost of a firm which is responsible for influencing the levels of customer service.

## 2.1 LOGISTICS MANAGEMENT

**Q1 Define logistics and logistics management. What are the different elements of logistics management?**

**Answer :**

*Model Paper-I, Q7(a)*

### Logistics

1. Logistics refers to that part of supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customer requirements.
2. Logistics is the process of determining customer needs, acquiring the capital, raw materials, labour, technologies and all other component parts required for the realization of these anticipated needs and optimally utilization the network capabilities for producing goods or services as per the requirements of customers in a timely manner.

*(Council of Logistics Management)*

### Logistics Management

Logistics management is a wide term, applicable to both private and nonprofit public sectors. In 1960's, the concept of logistics management was appeared in business literature as "Physical distribution management", which was mainly responsible for the management of external environment of logistics system. But in modern era, the term has been changed to "logistics" as it mainly deals with all the activities that have an impact on making goods and services easily available to the customers.

### Elements of Logistics Management

The following are the important elements of logistics management which are usually referred to as "wings of logistics"

#### 1. Transportation

It is one of the most important activities of logistics which involves the physical distribution of goods with the help of a network. This network is formed by a group of different transportation organizations who are engaged in providing value-added service to the firms, that are responsible for the physical movement of goods. The logistics manager must select those modes of transportation that brings reduced cost and increased profitability to the firm while moving raw materials, components and finished goods to the customers.

#### 2. Warehouse/Storage

Storage forms a trade-off relationship with transportation. Storage involves two different activities,

- (i) Inventory management and
- (ii) Warehousing.

There exists direct relationship between transportation and inventory levels and also the number of warehouses required, i.e., if slow transportation mode is selected, firm must maintain high levels of inventory which in turn requires more warehouse space.

#### 3. Packaging

Packaging plays an important role in protecting the component parts from damages during transportation or storage. Packaging is done with the help of cardboard boxes, stretch wrap, banding, bags and so on. Transportation modes have a drastic impact on the packaging requirements. Hence, efficient mode must be selected by considering the factors, such as nature of products, perishability, durability, locations to which goods must be transferred etc.

#### 4. Materials Handling

Efficiency of warehouse operations and designs are usually influenced by materials handling mechanisms. Logistics manager is held responsible for the movement of goods into warehouse, their placements in storage and their final movement to order picking and dock areas, so that they can be transferred to different location through various transportation modes. Mechanical equipments e.g., conveyors, forklift trucks, overhead cranes, and Automated Storage and Retrieval Systems (ASRS) also come under materials handling.

#### 5. Inventory Control

Inventory control is an important aspect of supply chain management. It involves two dimensions:

- a) Assuming adequate inventory levels and
- (b) Certifying inventory accuracy.

Where, the former requires logistic operations that controls the current inventory levels and places replenishment orders or prepare production schedules, so that inventory levels must be brought near to the predetermined levels. For example, when distribution channel fulfills the orders of customers, the levels of inventory in warehouses get reduced which can be brought to an acceptable level by placing replenishment orders (both manually or electronically).

While the later dimension is mainly concerned with the determination of current levels of inventory. As fulfillment of orders bring depletion of inventory, an electronic facilities information system is used for tracking the current status of inventory. This dimension is mainly concerned with the monitoring aspect of inventory levels.

#### 6. Order Fulfillment

Order fulfillment is an important element of logistics management as it mainly strives for reducing the lead-time i.e., the time taken by the firm from the placement of an order by the customer, until the products are satisfactorily delivered to the customers.

#### 7. Inventory Forecasting

Inventory forecasting has to play a very important role in inventory control, manufacturing efficiency and customer satisfaction. Accurate forecasts about the level of inventory is achieved, when it is done in conjunction with demand forecasts.

#### 8. Production Planning

Production planning/scheduling is another area, where logistics management plays an important role. It is closely related to inventory forecasting, as it enables the firm to determine the number of units of products that need to be manufactured, so that entire market should be covered.

#### 9. Procurement

Procurement comes under logistics activity as the transportation cost is directly related to the distance from where the raw materials can be purchased to fulfill the manufacturing needs of organizations. In terms of raw materials and component parts, the total logistics cost is influenced by the quantity of raw materials required for production processes.

#### 10. Customer Service

Two important aspects of customer service that are found to be crucial from the perspective of logistics management is that,

- i) Process of direct interaction with customers during order retrievals
- ii) Levels of service offered by the organization to its customers

From an order taking perspective, logistics ensure that adequate inventory is available with the organizations to fulfill the needs of customers in a timely manner. While on contrary to this, second dimension of customer service deals with the responsibility of logistics management to ensure that the customers get the right product at the right time in the right quantity.

#### 11. Facility Location

This dimension of logistics, plays a key role in changing the relationships between facilities and markets or between supply areas and facilities, which in turn, influences transportation costs, customer service and inventory requirements which put forwards the need for a logistics manager to take all the decisions regarding facility locations.

#### Q2. Discuss briefly the logistics management environment.

**Answer :**

The environment of logistics management is mainly classified into,

1. Internal environment and
2. External environment.

#### 1. Internal Environment of Logistics Management

The internal environment of logistics management is classified into two functions/activities depending on the nature of control

- (a) Direct control environment, and
- (b) Indirect control environment

##### (a) Direct Control Environment

This environment includes all those activities which are directly affected by the logistics function and as so logistics function gets easily affected by these activities. It mainly includes activities such as order administration, transportation, facilities, order size, quantity and inventory costs. Activities of logistics mix can be coordinated and controlled by logistics management.

##### (b) Indirect Control Environment

It includes all those conventional business activities over which logistics function has an indirect control influence on them. Some of the reasons may be due to operating cost of materials management increases due to, the unnecessary establishment of storages, more than that have been required by the firms. Due to marketing variations which makes some of the merchandise to be outdated. Even due to the blockage of cash in maintaining high levels of inventory, more amount of working capital is required for the business operations. Under all these circumstances, logistics activities are affected.

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**2. External Environment of Logistics Management**

The following are the important constituents of external environment of logistics management,

**(I) Supply Markets**

It mainly involves the expansion of firms into international markets which requires structured sourcing plans that must be designed by considering the "external skills" of operating environment. Structured sourcing/procurement plans along with logistics activities enable the firm to determine the cost of raw materials, component parts and finished goods.

**(II) Technological Factors**

Due to technological innovations, the nature of business activities have been changed to a great extent. Technology holds two fold impact on logistics operations, i.e., the logistics function not only needs to capture the changes in such as way that EDI and EPOS data capture in terms of operating models but it is also responsible for bringing changes in other functions, so as to accommodate new changes in them.

Such innovations in technology have brought changes in the entire logistics system example, in food industry-for the delivery of chilled products.

**(III) Trade Regulation and Control**

Certain perishable products, such as food items and drugs requires specific environmental conditions for their storage. Hence, Government must provide stringent rules for maintaining suitable ambience for the sale and delivery of such goods, such that consumer protection can be assured across the range of products. In order to perform such functions, the concept of reverse distribution has been emerged, where used/ill-quality goods are returned back to the manufacturers, whose reconditioning/reconditioning can make them to use for direct consumption.

**(IV) International Politics and Relationships**

In order to ensure the smooth flow of logistics activities, favourable operating environment is required which harnesses the growth of a focal firm. Even, it is found to be greatly affected by the changes in international relations, which in turn influences the demand and supply of products. Hence, favourable political environment and friendly relationships plays an important role in ensuring the efficient management of logistics activities.

**(v) Social Factors**

Social changes are characterized by changing the behaviour of consumers. Such rapid variations in the preferences of consumers need to be monitored and accommodated, which helps the logistics management in the exploitation of new opportunities that increases the profitability of the firm. This realizes the need for the development of multi-delivery system at customer designated times, which imposes potential problems on the logistics management.

**(vi) Economic Trends**

Due to globalization, as every business is expanding across its political boundaries, economic trends are playing a pivotal role in their global operations. Frequency changes in inflation rates and exchange rates demanded an updated logistics system which helps the firm in tackling all the challenges related with logistics management such as, reducing procurement cost, transportation costs and all other relevant costs have been found to be significantly increased in case of global operations. Even, the emergence and growth of economic unions have imposed new challenges to logistics management.

**(vii) Intermediaries and Partnerships**

In global logistics, focal firm must select only those partners that are willing to share their objectives, strategies and target customers. One of the most important aspect of channel structure is the extent of cooperation between supplier and distributor, while the other aspect involves the mutual trust and understanding among the trading partners.

**(viii) Customer Profiles**

It mainly deals with the collection of complete information about customers, methodologies and strategies, that needs to be adopted by the firm to address one or more market segments. A firm must focus on deriving a clear customer profile that helps the firm in identifying the important elements of customer service.

**(ix) Market Characteristics**

It mainly deals with the behaviour of operating market requirements for gaining competitive advantage in those markets, opportunities and challenges, and even about the functioning of these markets.

Thus, for the efficient management of logistics functions/activities, both external and internal factors need to be controlled in an effective manner so as to deliver the products to the customers at low possible costs.

### 2.1.1 Gaining Competitive Advantage Through Logistics

**Q3. How logistics management help an organization in gaining competitive advantage to deliver superior customer services?**

**Answer :**

Logistics is a part of strategic supply chain management which involves the procurement, movement and storage of raw materials, component parts and finished goods from the organization to the end-users with the help of marketing and distribution channels such that the current and potential profitability can be optimally achieved through the fulfilment of orders in a cost-effective manner.

Effective logistics management enables the firms to achieve competitive advantages over their competitors, such that customer always prefer the focal firm over its competitors. The concept of "gaining competitive advantage through logistics" can be studied by considering three variables, that are company, customers and competitors, which constitutes three - C's in competitive advantage as shown in figure (1).



Figure (1): The Three C's in Competitive Advantage

From an organization's perspective, competitive advantage may be defined as the ability of the firm to gain superiority over its competitors in terms of both cost and value, i.e., firms must deliver value-added products at a cost lower than their competitors, so as to gain competitive advantage.

In simple terms, the lowest cost producer or the supplier becomes industry competitor, if he is able to provide quality products (with perceived differentiated values) at low cost. Hence, productivity advantage and a value advantage are found to be the two important vectors of successful companies. Let us discuss each advantage in detail.

#### 1. Productivity Advantage

In order to achieve competitive advantage in production activities/operations, firms need to have two important features that are,

- They must produce large quantities of products, i.e., must have increased sales volume, and
- Furthermore, this bulk production must be produced at considerably low cost (Low Cost Producer).

The above two characteristics are found to be crucial in order to achieve economies of scale where fixed cost can be scattered over the large volume of outputs, such that fixed cost per unit of output can be reduced.

This phenomenon can be explained with the help of learning experience curve as shown in figure (2), which was introduced by Bruce Henderson, a founder of Boston Consulting Group. This curve is designed to represent a relationship between real unit cost and cumulative volume. According to this curve, there exists an inverse relationship between unit cost of a product and its cumulative volume i.e., cost per unit of a product decreases if it is produced in bulk quantity.

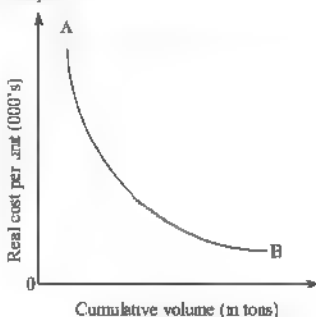


Figure (2): The Learning/Experience Curve

Thus, it has to be concluded that logistics management provides multiple alternatives to the firms through which efficiency and productivity can be increased and hence, it contributes significantly towards unit-cost reduction.

#### 2. Value Advantage

It is a famous saying that, "Customers don't buy products, they buy benefits", i.e., today customers are more concerned with the quality of service with which firms are catering to their needs instead of products offered by them. Firms are said to be successful, if they outperform in one or the other functional aspect than their rivals. Without offering differentiated products, firms offering are simply considered as "commodities" which do not serve the basic purpose of profitability. Hence, a proper strategy needs to be formulated to achieve value advantage which states that, only those firms can survive that add value to their products through the process of differentiation.

Let us consider a simple matrix, as shown in figure (3), where firms have been classified based on the nature of advantage which are as follows,

- (i) Service leader
- (ii) Cost and service leader
- (iii) Commodity market
- (iv) Cost leader

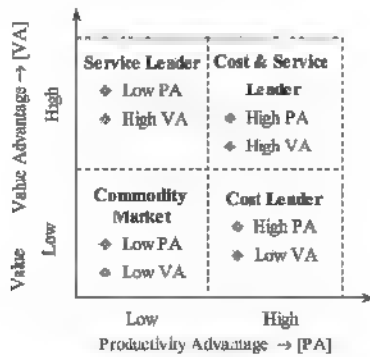


Figure (3): Logistics and Competitive Advantage

- (i) Firms that fall under commodity market are characterized by low productivity advantage and low value advantage, such that they do not have much cost advantage. They can achieve cost advantage either by adopting the strategy of a cost leader or a service leader. However, cost leadership is a difficult means for achieving competitive advantage as such markets do not offer substantial opportunities that reduces the total cost of firms.
- (ii) Firms falling under cost leadership make use of economies of scale for achieving competitive position in the markets, which enables them to produce increased volume of products at considerably low cost. This cost advantage is also helpful in achieving the position of "price leader" in an industry.
- (iii) However it has been found that effective management of logistics system is also the most powerful tool for gaining competitive edge over their rivals, because logistics cost accounts for major proportions of total costs.
- (iv) "Service excellence" is also found to be another means through which firms are competing in the present markets. Today, customers are desiring for greater response and supplier's reliability, they are focusing on reduced lead times, JIT delivery and demands for value-added services to fulfill their orders.

Thus, the logistics is facing the main challenge of converting/transforming a low performance organization from commodity markets to a high performance organization based on differentiation and cost advantage.

#### Gaining Competitive Advantage Through Logistics

Traditionally, firms believe that adoption of different strategies enable them to achieve competitive position in the market, but in recent times in addition to strategies, creation of value chain is found to be a driving force behind the success of any firm.

According to Michael Porter, "Competitive advantage stems from all those activities whose performance enables the firm to achieve cost advantage over their competitors which form the basis for differentiation. The value chain disintegrates all the activities of logistics management, so as to understand the cost behaviour of each activity and to identify all their possible sources of differentiation."

Based on the nature and functions of various activities, value-chain activities are broadly categorized into two types,

- a) Primary activities
- b) Secondary activities.

The extent to which organization becomes competent, mainly depends on the ability of the firms as to how effectively they can manage these activities of value-chain. To achieve competitive position in the market, firms need to carry out their functions more efficiently than their competitors do, then only it can create a sense of differentiation in the minds of customers.

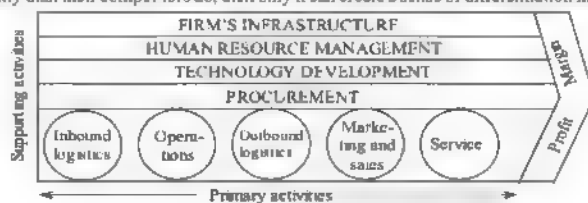


Figure: The Value-chain

Thus, competitive advantage can be achieved by the firms, if they have both cost and productivity advantage where better utilization of capacities, inventory reduction and closer bonding with suppliers contribute towards productivity advantage, while increased responsiveness, improved supplier's reliability and quality service are the key features for gaining value advantage.

#### Q4. Compare and contrast logistics management with SCM.

Answer :

Model Paper-II, Q7(a)

The differences between logistics management and SCM are as follows.

S.No.	Criteria	Logistics Management	Supply Chain Management
1	Definition	Logistics is a strategic process which involves the procurement of raw-materials, or component parts from suppliers to manufacturers and then the final delivery of products to the customers.	SCM is an integrated network of upstream and downstream activities that are engaged in delivering superior value to customer at low cost.
2	Origin	It emerges from the concepts of military planning.	It is an extension of logistics management.
3	Nature of integration	It is usually formed by the internal integration of logistics functions with that of management functions.	It involves external integration of different roles associated with different parties of supply chain.
4	Scope of operations	It has narrow scope as it involves outbound logistics, in-process inventory and inbound logistics.	It has wide scope as it involves different parties such as vendors, manufacturers, retailers, distributors and customers.
5	Principal objective	Cost minimization by optimally allocating resources to different functional areas.	Corporate profitability by creating value for different members of supply chain.
6	Focus	It is supply-driven as it is mainly concerned with taking the products to the end-users at low possible cost.	It is customer-focussed demand-focussed as it is mainly concerned with satisfying the customer demands by delivering value-added service products to them.

## 2.2 INTEGRATED LOGISTICS MANAGEMENT – INBOUND AND OUTBOUND LOGISTICS

### Q5. Explain briefly about integrated logistics management.

Answer :

#### Integrated Logistics Management

Integrated logistics management is an approach to the distribution mission of the firm whereby two or more of the functions involved in moving goods from source to user are integrated and viewed as an inter-related system or sub-system for purposes of managerial planning, implementation and control.

Professor Bernard La Londe

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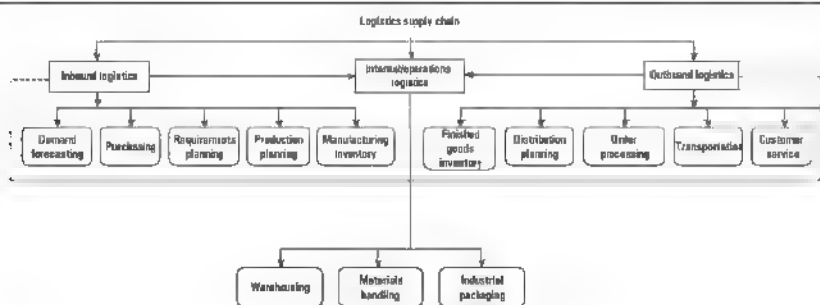


Figure: Integrated Logistics Management

**I. Inbound Logistics**

The term 'inbound logistics' refers to all those activities that are found to be associated with the transfer of goods from the suppliers to the manufacturing plant, such that value-added goods can be delivered to the ultimate customers for their final consumption.

The following are the elements of inbound logistics

- (i) Demand forecasting
- (ii) Purchasing
- (iii) Requirements planning
- (iv) Production planning
- (v) Manufacturing inventory

**II. Internal/Operations Logistics**

It includes the following components,

- (a) Warehousing
- (b) Materials handling and
- (c) Industrial packaging

**(a) Warehousing**

For answer refer Unit-II, Page No. 2.2, Q.No. 1, Topic: Warehouse/Storage

**(b) Materials Handling**

For answer refer Unit-II, Page No. 2.2, Q.No. 1, Topic: Materials Handling

**(c) Industrial Packaging**

For answer refer Unit-II, Page No. 2.2, Q.No. 1, Topic: Packaging

**III. Outbound Logistics**

It is also termed as "physical distribution" management. It may be defined as the set of processes, systems and capabilities associated with the physical distribution of goods which enhances the firm's ability to serve its customers.

**Example**

Orders fulfilled by the famous retailers, such as L.L. Bean, Lands end and Eddie Bauer constitutes outbound logistics activity.

The following are the elements of outbound logistics,

- (i) Finished goods inventory
- (ii) Distribution planning
- (iii) Order processing
- (iv) Transportation
- (v) Customer service

**Q6. What is Inbound logistics? What are its different elements?****Answer :****Inbound Logistics**

Inbound logistics embraces the flow of raw materials, component parts, and supplies into the production, manufacturing process. Inbound logistics referred to as materials management. It is an integral part of total management of an organization. Inbound logistics issues are reviewed as subareas of production management.

The objective of logistics management on the inbound side of the production line is virtually the same as it is on the outbound side to provide a given level of customer service at the lowest total cost.

Inbound logistics activities in fact add value to the finished product by ensuring that high-quality raw materials continually flow into the production process at a reasonable cost. Purchasing is one of the most important components of an inbound logistics activity and is becoming more so as firms search globally for their suppliers.

**Elements of Inbound Logistics**

The following are the elements of inbound logistics.

**1. Demand Forecasting**

Demand forecasting is an important step in inbound logistics, wherein operating decisions are taken based on the forecasted results of demand for consumer's products. Through demand forecasting techniques, firms estimate both future and potential demand of their products, so as to ensure that sufficient quantity of goods must be available with the firm in order to meet consumer's demand.

**2. Purchasing**

It involves the process of procurement of goods, raw materials and others component parts from various suppliers depending on the consistent requirements of the firm. It integrates different members of supply chain and plays a key role in delivering quality products to the customers.

**3. Requirements Planning**

In this activity, logistics manager has to take various decisions regarding the selection of materials and equipments. Such type of decisions are mainly influenced by the nature of operations and also about the outputs constituting the firm's products. Firms must select only those materials that are of high quality and those which can be obtained at low cost.

**4. Production Planning and Control**

Production planning and control is mainly concerned with the proper alignment of products demand with its supply, i.e., it ensures that there is a proper supply of firm's products which helps in fulfilling the demands of customers. Firms can seize new opportunities of gaining profits only by maintaining a proper balance between firm's production and distribution activities.

**5. Manufacturing Inventory Control**

It mainly deals with all those activities which are responsible for controlling the levels of inventory throughout the supply chain. Inventory needs to be available with the firm, so that it can process and fulfill the orders of customers on time.

**Q7. What do you mean by outbound logistics? State its elements.****Answer :****Outbound Logistics**

Outbound logistics is defined as, "Movement of materials associated with storing, transporting, and distributing an organization's goods to its customers."

Outbound logistics serves as a reference to documentation, picking, packing, physical goods issue in warehouse, loading, goods issue posting, advising advanced shipping notifications to business partners and obtaining a proof of delivery from the receiving business partner.

Outbound logistics processing comprises the preparation of goods to be delivered from a warehouse to a receiving location, which is within the scope of warehouse management. Outbound logistics process is supported by the different software packages like SAP, ERP.

To keep supply chain activities running smoothly, firms need to efficiently store, move, and transport goods while keeping inventory at minimum levels. Outbound logistics performance is an important task in SC. General sourcing is used for servicing end customers. At the same time, outbound costs need to be minimized while processes, flexibility and customer service must be improved. Outbound logistics covers and supports the following:

- (i) Operational shipping, manifesting, freight costing, freight settlement and foreign trade.
- (ii) Build optimal loads with the routing and scheduling allowing a close collaboration between shipper and carrier via optimized carrier selection and tendering.
- (iii) Trace and track the history of the warehouse processes in detail for each individual article.
- (iv) All the processes in the warehouse from goods receipt through goods issue.
- (v) Complete stock transparency, to allow firms to know what is in the warehouse.
- (vi) Improve the accuracy of deliveries, thus increasing customer satisfaction.
- (vii) Option to use electronic data entry and work in a paper-free environment.
- (viii) Option to use RFID (Radio-Frequency Identification) to support goods issue and goods receipt processes.
- (ix) Notification of goods to be supplied from a warehouse to a customer etc.

In SC process, once goods are produced, they need to be delivered to customers in a cost-effective way that still meets expectations regarding service and availability. Outbound logistics deals with warehousing and distribution of finished goods and puts them at the disposal of customers worldwide. It deals with customized storage facilities with line hauls, home delivery, installation, picking and packing etc. and adds value to goods.

### Elements of Outbound Logistics

The following are the elements of outbound logistics.

#### 1. Finished Goods Inventory

Inventory of value-added goods is mainly dependent on demand forecasting measures. However, if firm produces finished goods in large quantity more than that which is required by the customers then it has to incur huge losses due to high carrying cost of inventory (of finished goods).

#### 2. Distribution Planning

It is a widely used technique for outbound logistics system which influences the decisions related to the distribution of goods, component parts to the customers. It refers to the transfer of right product to the right place at the right time. It enables the organization to which create their Distribution Requirement Plans (DRPs), which can be used for the accurate determination of distribution lead times.

#### 3. Order Processing

It usually involves the credit worthiness of customers, information transfer from customers to the sales records, then processing and sending the orders to the shipping areas accompanied by the preparation of shipping documents. Such functions can be performed simultaneously by the use of updated operating systems.

#### 4. Transportation

For answer refer Unit-II, Page No. 2.2, Q.No. 1, Topic: Transportation.

#### 5. Customers Service

For answer refer Unit-II, Page No. 2.3, Q.No. 1, Topic: Customer Service.

## 2.3 LOGISTICS PLANNING

**Q8. What is logistics planning? Explain the process of logistics planning.**

**Answer :**

*Model Paper-III, Q"(a)*

### Logistics Planning

Logistics planning takes place when there is a need of transportation of materials among different entities who are involved in SC. The main objective of logistics planning is to assure that materials are transported from the place of origin to the end user on the basis of setup cost, schedule and quality norms. Logistics planning involves all types of materials such as raw materials both semi-finished goods and finished goods. It also involves making choices of alternative means of transportation, warehousing and transshipment, conforming to statutory requirements, supporting rules and regulations, selection of partners who undertake transportation and allied work, evaluating their performance and providing feedback etc.

### Logistics Planning Process

The logistics planning process is shown in the figure below.



**Figure: Logistics Planning Process**

#### 1. Translation of Sales Plan into Procurement Group Forecast

The primary step in logistics planning process is translation of the aggregate sales forecast into product-group-level procurement forecasts. Providing the firm with an entire product group requirements that matches with the inventory targets and financial and logistics capacity constraints is the main objective of procurement planning. The development of procurement planning is the joint responsibility of general management, logistics, marketing, sales and finance. The procurement planning output is defined in aggregate units of measure such as dollars or total units. The procurement plan should be reviewed and updated on a periodic basis. A procurement plan is considered to be effective if it is reliable with marketing and sales plans along with the company budgets included in the business plan.

**2. Verifying the Aggregate Shipping Plan**

The aggregate shipping plan is converted in the same product-groups, units of measure and time periods as the sales plan is composed of elements such as current customer order backlog, current customer backorders, and forecast by product group. The total dollar shipment figure should provide the sales revenue targets mentioned in the business plan. The shipping plan allows the firm to review the entire product line by product line based sales and inventory performance against the business plan.

**3. Building the Firm's Inventory Plan**

The traditional process of inventory plan focuses more on the inventory cycles through purchasing, stocking and shipping processes. The frequently used method of computing inventory turnover is through ratio method i.e., by dividing the forecasted annual cost of sales with average inventory level. The average inventory can be evaluated by adding the opening balances of product groups by period and in the previous period, adding all receipts and subtracting all shipments. The real value of the inventory planning is obtained by reviewing inventory balances every month through out the business year. Such monthly reviews allows marketing, sales and logistics management to calculate the sales performance of actual products with targeted inventory levels.

**4. Determining the Total Logistics Resource Requirements Plan**

The final step in the logistics planning process is to determine the total logistics resource requirements plan. In logistics planning capacity planning involves the aggregate resources that are required to encourage sales, shipping and inventory targets. In an enterprise the resources are classified as, inventory investment, transportation costs, warehouse space capacities, labor and equipment needs. These elements are required to obtain the planned procurement for each product.

Once the marketing, logistics and sales planning process is completed, the firm can measure the planned cost of sales, sales income and other operating expenses of products and services per year. Such results helps the enterprise to validate the business plan ROI (Return on investment) and to evaluate the available financial resources for the further growth of the firm. Moreover, shipment requirements and product group overview are used to acquire complete purchasing, delivery, inventory, facilities planning and demand management.

Thus, the logistics planning process builds a medium-range logistics operations planning platform for the top management.

**2.4 LOGISTICS STRATEGY**

**Q9. What is logistics strategy? State its features.**

**Answer :**

**Logistics Strategy**

The concept of logistics strategy is not yet evolved completely because of which it has not gained a proper definition. Thus, today, the term "logistics strategy" still presumes differently by different people.

Logistics strategy mainly deals with the determination of performance standards that has to be maintained in an organization. Most of them, establishes such standards in terms of service levels and cost objectives. Firms can achieve the desired logistics performance only by maintaining proper trade-offs between cost and service objectives. In order to make it effective, it needs to be integrated with corporate and marketing objectives.

**Features of Logistics Strategy**

Following are the important features of an integrated logistics strategy,

**1. Consistency**

For the development of an integrated strategy, all strategic activities need to be consistent across the entire supply chain, which in turn is a prerequisite for the long-term implications of a corporate market development strategy.

**2. Consonance**

It is two dimensional in nature as it helps in providing awareness about both competitive and customer related marketing situations. Where one dimension is intended to bring flexibility in the logistics activity responsible for changing both corporate and marketing perspectives, while the other is concerned with environmental changes (e.g., technological changes and competitive changes).

**3. Creativity**

It helps in the determination of core competencies required for gaining competitive advantage. An example of creativity could be the design of customized offerings depending on the special needs of customers. Resource allocation problems can also be tackled with creativity.

**Q10. Define integrated logistics management and integrated logistics strategy. How an integrated logistics strategy can be developed?**

**OR**

**What is integrated logistics management? How to develop integrated logistics strategy?**

*(Model Paper-II, Q7(b), May/June-16, Q3(a))*

*(Refer Only Topics: Integrated Logistics Management, Developing an Integrated Logistics Strategy)*

**OR**

**What is integrated logistics strategy? Discuss the process involved in developing integrated logistics strategy**

*(Refer Only Topics: Integrated Logistics Strategy, Developing an Integrated Logistics Strategy)*

**Answer 1**

*May/June-13, Q3(a)*

### **Integrated Logistics Management**

Integrated logistics management is an approach to the distribution mission of the firm whereby two or more of the functions involved in moving goods from source to user are integrated and viewed as an inter-related system or sub-system for purposes of managerial planning, implementation and control

*Professor Bernard La Londe*

### **Integrated Logistics Strategy**

For answer refer Unit-II, Page No. 211, Q.No. 9, Topic Logistics Strategy

### **Developing an Integrated Logistics Strategy**

The logistics strategy can be made effective by identifying the components of the process and then moving on to the development of the strategy document

Components of the logistics strategy process can be represented as shown in figure



**Figure: Components of Logistics Process**

The corporate logistics strategy, determines the methods with which it can effectively utilize the logistics function for the achievement of overall corporate objectives. After identifying the components of strategy, the next step is to integrate them with the pre-stated corporate strategic direction

Thus, the logistics strategy enables the firm to determine, how the customer service can act as a supporting force for achieving corporate/marketing goals through efficient deployment of resources. Transportation, facilities, inventory and the information technology acts as building blocks of logistics strategy

The following are the basic components of an integrated logistics strategy,

#### **1. Corporate Strategy**

Corporate strategy is mainly responsible for the achievement of corporate objectives such as,

- (a) To achieve high sales volumes and profit growth
- (b) To improve the profit margins and cash flows of logistics operations
- (c) To increase the profitability ratios i.e., return on capital employed and return on equity
- (d) To achieve competitive position in an industry
- (e) To expand the firm's operation on a global scale
- (f) To diversify the business operations

#### **2. Marketing Strategy**

It mainly deals with the policies of products and customer service, distribution intermediaries and promotional modes with which companies offerings can be communicated to the general public. It achieves the following objectives

- (a) To achieve competitive advantage in the market by occupying significant proportion of market share
- (b) To provide quality service to the customers
- (c) To enhance the levels of customer satisfaction
- (d) To select that market as a "target market" which provides ample of opportunities for growth and expansion
- (e) To accurately forecast the demand of firm's products, so as to maintain equilibrium between supply and demand

### 3. Physical Distribution Strategy

It considers transportation, facilities, inventory management and information management while formulating a distribution strategy. It is associated with the physical distribution of goods between the various partners of supply chain in such a way that it would reduce the cycle time of customer orders and would increase the service reliability.

**Q11 What is the role of transaction channels in developing an integrated logistics strategy?**

**Answer :**

The following figure represents the importance of transaction channels in the overall development of an integrated logistics strategy. Market coverage and product characteristics are the important dimensions of both transaction channels and physical distribution channels.

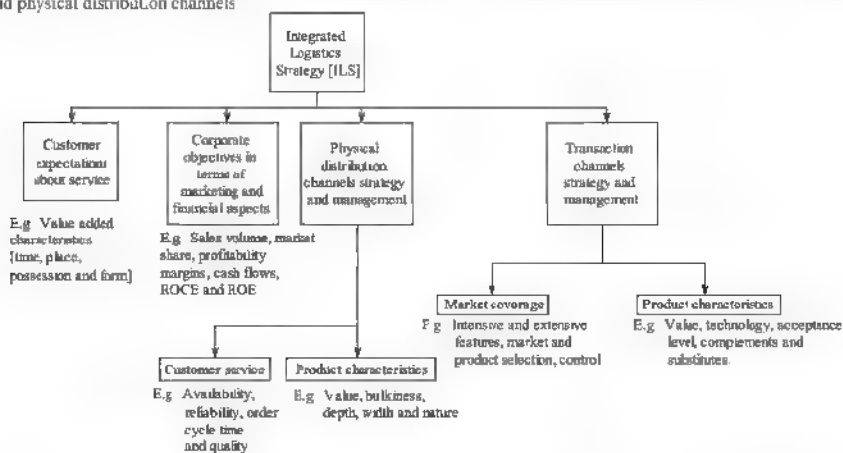


Figure: Role of Distribution Channel in an ILS

#### 1. Market Coverage

It is an important criteria during the selection of an intermediate channel by the suppliers. The suppliers must select only those channels that matches with the expectations of customers. Products can be distributed through intensive or exclusive modes

##### (a) Intensive Distribution

It is mainly used for the transfer of everyday used products and consumable industrial products, where the purchasing pattern is favorably short term, as customers will be maintaining considerably less stock than they do for other types of products

##### (b) Extensive Distribution

It involves partnership where an intermediary act as a "franchisee", while a "franchiser" is a focal firm. Such a partnership helps in providing mutual support and also in the development of sales. This type of distribution is favourable for the sale of consumer products wherein customer desires for a wide range of selection.

##### (c) Selective Distribution

This type of distribution is usually used by a focal firm, if it has to provide products only to a limited range of customers. Usually, the markets being served are very large, hence their decisions are affected by the nature of service and after-sales service offers for maintaining good customer relationships.

##### (d) Outlet Selection

Outlet selection adds complexity to the entire logistics strategy. Outlet selection is mainly dependent on the nature of products and their characteristics. For example, products such as convenience type whose investment in inventories is less and whose fixed capital can not be considered, requires less factor consideration for outlet selection than that of expensive consumer products or high-tech industrial items.

**(e) Market Control**

Suppliers function can be controlled by developing a control device which identifies the critical success factors responsible for maintaining effective channel partnership structure required for the operations of channel partnerships.

Thus, any activity that could or should be performed by the suppliers holds an impact on the cost profiles of retailers which can be used as a selection criterion.

**2. Product Characteristics**

Selection decisions of channels are also influenced by the characteristic features of products. For example, size, quality, reliability etc., constitutes the product characteristics.

**(a) Value**

Value of a product is an important dimension. Value is directly proportional to the amount of working capital required in supply chain. As, value and the sales turnover are correlated, stockholding and cash flows required for maintaining inventory levels determining the service level expectations influences the need for intermediaries. It also influences the physical distribution channel as shown in figure.

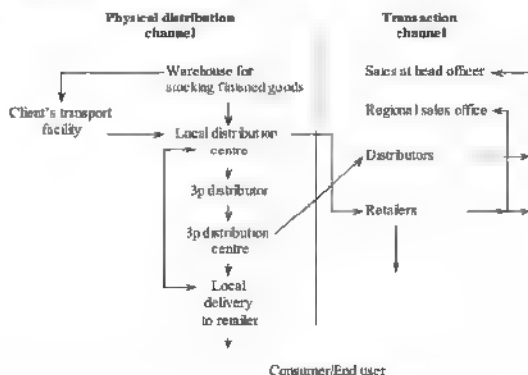


Figure: Coordination and Integration of Physical Distribution Channel and Transaction Channel

**(b) Technology**

Other factor influencing distributor selection is the technology. Complex products require additional investment in terms of specialized equipment and service parts inventory. These are additional costs that the firm has to bear apart from the cost of inventory.

**(c) Consumer Acceptance**

Consumer acceptance or brand awareness plays an important role in determining the extent of efforts that has to be put forward by the firms for the sale of products. Such efforts could be less if the firm introduces new products to the existing range of products. Whereas huge efforts are needed for new brands introducing new products as for their promotions, firms have to pay bonus to the distributors and retailers.

**(d) Product Complements**

It becomes a usual phenomenon for distributors to produce innovative product range. If distributor has a complementary product with the existing market products, then their sale would be beneficial to both suppliers and distributors. Even, such type of products increases the average customer transactions by increasing the overall sales volume.

**(e) Product Substitutes**

Product substitutes are available for competitive products, which places a premium on shelf space and other POS displays in case of intense customer areas.

**Example**

This is mostly seen in case of convenience products that have low-brand loyalty and low purchase prices.

Even, they have an influence on the trade margins of low-brand loyalty products which require higher margins as incentives. A specialist distributor helps in making the entire logistical activity as an easy task and also enable suppliers to provide effective support to the focal firm.

Thus, a logistics manager needs to consider all the above mentioned factors while developing an integrated logistics strategy.

## 2.5 REVERSE LOGISTICS – MEANING, NEED, BENEFITS AND PROCESS

**Q12. What do you mean by reverse logistics? State its need and benefits.**

**Answer :**

*Model Paper-I, Q\*(b)*

### Reverse Logistics

According to Rogers and Tibbon Lemble, reverse logistics is a process of planning, implementing and controlling the efficient cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or for proper disposal.

Reverse logistics is gaining a wide scope in a present scenario due to the endless generation of waste material, whose recycling and reproducing plays a major role in increasing the profitability of a firm. Today, most of the firms are engaging themselves in reverse logistics activities. The management of reverse supply chain is a difficult task as it is mainly influenced by the planning and forecasting methods. Hence, firm must maintain proper schedules for both planning and forecasting for future products and requirements of the firm.

In India, well organized reverse logistics are practiced by majority of the firms/industries.

### Example

Paper industry has established a well organized collection modes for collecting used paper whose recycling produces fresh paper which in turn reduces the additional usage of wood [which is acting as a raw material in paper industry]. Reverse logistics is a "green concept" where organizations are emphasizing more on improving the social and environmental conditions of customers rather than just striving for profits. Thus Environment Friendly Supply Chain (EFSC), which enables the firms to achieve the position of a "responsible corporate citizen" needs to be designed.

### Need for Reverse Logistics

As reverse logistics mainly deals with all the operations related with the recycling or remanufacturing of products and materials, it can also be termed as "Product Recovery Management" (PRM).

Reverse logistics considers the following aspects.

1. Determination of alternatives for the recovery of products and component parts
2. Decisions related to the selection of persons who are responsible for performing all these reverse logistics activities
3. Finds out the ways with which these activities can be performed
4. Integrating the activities of reverse logistics with classical production and distribution systems.
5. Conducting cost benefit analysis to determine both the cost and benefits of reverse logistics

### Benefits of Reverse Logistics

"Reverse logistics are not simply a matter of driving the truck on the opposite way". However, it is associated with both benefits as well as challenges. The following are the important benefits of reverse logistics,

- (i) It helps in reducing the operating cost as the used, returned products become the input of production, remanufacturing process.
- (ii) It increases the efficiency of operations.
- (iii) It helps in enhancing the levels of customer satisfaction as the non-desirable products can be collected by the firms and can be subjected to recycling, retreating, so as to form desirable products as per the requirement of the customers.
- (iv) Reverse logistics plays an important role in improving the environment and making it "clean and green" by efficiently utilizing the used waste products.

**Q13. Describe the process of reverse logistics. Explain, how it differs from forward logistics.**

**Answer :**

### Process of Reverse Logistics

Conventionally, the process of production ends with the customer. Whereas, in firms dealing with reverse logistics, customers are the initial points/sources of processing. Reverse logistics in synchronization with source reduction processes not only enables the firm to reduce cost but also helps in building the image of "a responsible corporate citizen".

Mainly the process of reverse logistics initiates at warehouses which includes the following activities,

1. Returns management
2. Remanufacturing
3. Remarketing
4. Recycling and
5. Disposal

Let us know about each activity of reverse logistics

**1. Returns Management**

This stage is mainly responsible for the effective management of used/waste products. It must ensure that a proper storage facility is provided for stocking used/waste products. It channelises the collection and storage of recalled products.

**2. Remanufacturing Facility**

At this stage, stocks of returned products are subjected to production processing which improves the performance of returned products. This remanufactured products increase corporate profitability by enhancing sales through price discount offerings.

**3. Remarketing**

In this stage, remarketers make use of coordination and reverse flow strategies for positioning and resale of these products when such products are not required by the original users. The Defense Logistics Agency (DLA) has established a comprehensive remarketing process by which used equipments can be transferred to other military services.

**4. Recycling**

Recycling is associated with the disbursement of returned products into their component parts such that they can be reused in more efficient manner than they would have been used previously. When they cannot be reused effectively, they need to get disposed off in the appropriate landfills (which also comes under reverse logistics).

**5. Disposal**

If the returned products cannot be recycled or remanufactured then they have to be disposed in the appropriate landfills depending on the nature of the products.

**Example**

Polythene bags used for carrying materials cannot enter into remanufacturing process hence can be disposed off with the help of waste dugouts, where pits are constructed for their decomposition.

**Forward Vs Reverse Logistics**

The difference between forward and reverse logistics are as follows,

Forward Logistics		Reverse Logistics	
1	Forward logistics refer to a process of planning, implementing and controlling the efficient flow of raw materials, component parts, finished goods and information, from the point of origin to the point of final consumption for the purpose of achieving customer satisfaction.	1	Whereas, in case of reverse logistics, raw materials, in-process inventories, finished products and information flows from the point of consumption to the point of origin for the purpose of recapturing value or for their proper disposal.
2	Demand can be forecasted by adopting suitable forecasting techniques.	2	Demand forecasting is a difficult task.
3	Quality of a product is uniform.	3	Quality of a product is variable.
4	Distribution centers may vary from one to many.	4	Distribution centres may vary from many to one.
5	Pricing is found to be a relatively uniform measure.	5	Pricing depends on various factors that influence the price of the products.
6	Distribution cost is less and is visible.	6	Distribution cost is more and cannot be determined clearly.
7	Process feasibility is more.	7	Process feasibility is less.
8	Its product life cycle consists of introduction, growth, maturity, saturation and decline stage.	8	In reverse logistics, returned products have to be passed through recovery, remanufacturing, remarketing, recycling and disposal stages.
9	Products can be marketed by adopting efficient strategies.	9	Product marketing is a difficult process as it does not have standardized marketing strategies.
10	Inventory management is consistent.	10	Inventory management is inconsistent and variable depending on the nature of returned products.

**Q14. Explain the role played by reverse logistics in creating value in SCM.**

**Answer :**

Role of reverse logistics in SCM can be understood from the following points,

#### **Managing Reverse Flows**

Several key activities or issues need to be considered while managing reverse flows in an efficient and effective manner. It has both pros and cons, as its proper management can improve firm's financial position, while its mismanagement brings heavy losses to a firm. Hence, proper care must be taken for its management which involves the following considerations,

##### **1. Avoidance**

Reverse flows can be avoided by delivering quality products at the initial stages of production by following efficient processes that minimize returns.

##### **2. Gatekeeping**

By keenly checking and screening merchandise at each stage of reverse logistics enables the firm to eliminate unnecessary returns.

##### **3. Minimizing Reverse Lead Times**

Adoption of those processes which can reduce the cycle times for returns so that they can capture value at considerably low times.

##### **4. Information Systems**

Suitable and updated information systems play an important role in improving product feasibility, uncertainty and economics of scale.

##### **5. Facility Layouts**

Firms must ensure that return centres are located optimally at various locations so as to facilitate the smooth flow of reverse logistics operations.

##### **6. Pricing**

Fixing the best price to the returned or resold products helps in generating huge revenues for the firm.

##### **7. Outsourcing**

By outsourcing various functions, firms can gain increased efficiency and can reduce operating cost which it has to incur while carrying out in-built activities.

##### **8. Zero Returns**

Firms can improve customer expectations either by providing returns allowance or by destroying them when they are unable to fulfill their expectations.

##### **9. Recovery of Assets**

Classifying the returned items such that surplus, scrap or obsolete items can be discarded while only recyclable products reach the reverse logistics process. Thus, by following the above prerequisites, reverse flows can be managed profitably and efficiently.

#### **Achievement of Value Through Reverse Logistics**

The most important challenge that every reverse logistics firm is facing is, to enhance profitability and to reduce cost by recapturing value by returned goods.

It is a fact that remanufacturing or refurbishing of products is much more costlier affair for a firm than to produce new products. This increased cost is due to additional cost contributors, one such being a transportation cost which accounts for about 25% of the total cost or more than that.

The estimation of the total cost associated with the reverse flows is the most difficult task. Some firms depend on the historical averages while others make use of ABC (Activity Based Costing) method for the estimation of budgeted cost. Firms should ensure that they have considered all costs associated with reverse flows irrespective of the method used for their estimation. Various costs include inventory cost, storage cost, transportation cost, handling cost, labour cost, packaging cost and other overhead costs. After estimating the total cost, firm must evaluate economic value of products through trade-off analysis.

After the evaluation of economic benefits of products, next step is to identify various external and internal factors acting as obstacles in the implementation of reverse logistics programmes. Some of them might be

1. Less priority that has been given to the recycling process hinders its implementation.
2. Lack of proper attention of top management.
3. Absence of financial resources required for the operations.
4. Lack of skilled personnel for the development of reverse logistics programs.
5. Establishment of state, local or federal laws ascertaining to safeguard environment.

Hence, before initiating the reverse logistics process, every firm must give special emphasis to the above listed obstacles so as to ensure the proper management of reverse logistics functions.

By identifying the third party logistics company, various tactical and strategic issues can be resolved which helps in making reverse flows program a value stream rather than waste stream.

Efficient management of reverse flows may not act as core competency of an organization but could be treated as a natural source for outsourcing. The following are the value added advantages provided by the 3PL provider.

- 1 Application of IT for maintaining inventory of products specially in case of a time-sensitive products. (Example, computers, cell phones, PDAs etc.) which have reduced life cycles and high risk of obsolescence. 'The value of time' is a crucial factor that needs to be considered in a return process as they are time-sensitive, even a small time delay could be disastrous for firms.
- 2 It reduces operating cost as it makes use of returned/reused products.
- 3 Increases the value of products by subjecting them to recycling or remanufacturing.
- 4 Maintaining eco-friendly relationship with an environment by producing high quality goods which in turn reduces pollution or waste discharge into the environment.
- 5 Efficiency of the process can be obtained at low cost as 3PL provider is already found to be efficient in performing such activities.

### 2.5.1 Reverse Logistics Strategy

**Q15. How firms can derive a reverse logistics strategy? What are the drivers of reverse logistics?**

**Answer :**

#### Reverse Logistics Strategy

There is no specific reverse logistics strategy that can be applied to all the firms of an industry. However, it varies from one firm to another. This variation occurs because of changes in the number, frequency and character of returned items which is highly specific for a particular industry.

#### Example

The needs of a small online grocery retailer, supplying component parts to the large customer base is entirely different from that of heavy automobile industry, providing small component parts to regional suppliers.

Even, the balance of disposition options undergo a drastic change. This variation is due to the changes in the number of items that has to be repaired, refurbished, remanufactured and recycled. The following are some of the significant features seen in most successful reverse logistics strategies.

- 1 Even though all vendors of supply chain are providing the basic functionality of reverse logistics, they are not efficient in providing an effective module of reverse logistics. The best partners of supply chain are servicing the broad range of customers by offering flexible functionalities.
- 2 On line retailer can evaluate the reverse logistics strategy in terms of transactions and capabilities of e-SCM (where e-commerce systems are used). Such transactions (or systems) need to be designed where

sales turnover and customer service should be high by keeping the operating expenditures at their lowest possible extent.

- 3 Logistics manager need to decide whether the elements of reverse logistics process have to be outsourced or to be insourced depending on the results of cost-benefit analysis. Such that at a technical level he can outsource activities such as installation, maintenance and day-to-day activities of reverse logistics, IT applications by undergoing an application service provider agreement, which reduces the firm's burden of hiring new systems and hardware.

Similarly, at a physical level, outsourcing is seen where Third Party Logistics (3PL) providers are engaged in collection, handling and processing of returned items. If these 3PL providers are working along side the users then they can be well-equipped with the requirements of customer base for returned items such that returned goods for processing, repackaging or reselling can be directly received by them. Hence, while devising a strategy for efficiently carrying out reverse logistics operations, the above stated features need to be encountered which helps in improving performance and also in reducing costs.

#### Drivers of Reverse Logistics

Due to the substantial growth of reverse processes in most of the industries, firms need to understand the major drivers of reverse logistics operations which helps them in identifying both the challenges and opportunities.

In this context these forces have been identified, which are as follows.

#### 1. Customer Returns

Customers return products, if they are unable to meet their requirements or if they are characterized by defects, warranty problems, recalls or mis-shippments. If these returned products can be processed in an efficient manner then this would increase the revenue generating opportunities of the firm as they hold a substantial impact on firm's profit and loss statement. By incorporating customer return issues as a key element of customer service policies, increased levels of customer satisfaction can be achieved.

#### 2. Environmental issues

Certain regulatory policies at state, local or federal level forces the firms to produce eco-friendly products, new standards and also their role in implementing several recycling programmes, constitutes their ethical role and corporate social responsibility. These policies are not only beneficial in improving the standard of living of people but also helps in improving the overall efficiency of an environment by maintaining effective relationships with suppliers so as to reduce cost, production times, pollution and to increase productivity.

**3. Economic Value**

Most of the business-oriented firms including the nonprofit organizations are deriving economic benefits from reverse logistics, i.e., recycling and remanufacturing of reused products can be practised for obtaining both profits and customer value. However, profitable management of reverse flows is both a challenge as well as an opportunity.

**2.6 INVENTORY MANAGEMENT – MEANING AND IMPORTANCE**

**Q16 What is inventory and inventory management? State the importance of inventory management in SCM.**

**Answer :**

**Inventory**

Inventory refers to the stock of the products that a firm is offering for sale to produce final products. In other words, inventory is composed of assets that can be sold by the firm in the future course of business operations.

Thus, inventory represents the least liquid current asset of a firm, which constitutes an important component of firm's balance sheet. Inventory could be in the form of raw materials, WIP, and finished goods that have been stored in warehouses.

**Example**

Pearls held by a pearl jeweller, component parts owned by Microsoft and processed foods in the warehouses of grocery stores.

Mathematically, inventory level can be obtained by deducting cumulative demand from its cumulative supply.

$$\text{Inventory stock} = \text{Cumulative supply} - \text{Cumulative demand}$$

**Inventory Management**

Inventory management is of strategic considerations for the firms whose mismanagement increases the working capital requirement across the supply chain thereby increasing the cost burden on one or more agents. The following aspects need to be considered while taking any strategic decision.

1. Type of supplier supplying the component parts.
2. Location and party i.e., from where it needs to be sourced and to where it should be stored.
3. Level of inventory that needs to be available with the firm.
4. Methods through which orders have to be dispatched either directly to the customers or to the intermediaries.
5. Role of information in inventory management.

**Importance of Inventory Management in SCM**

Inventory management is gaining considerable attention in the recent years due to the following major factors.

1. Economic recession has resulted into the scarcity of resources, which in turn brings reduced sales volume and revenue growth. This has forced management to adopt various methods to efficiently reduce the levels of inventory within the logistics systems so as to maintain the profit margins.
2. Emergence of new manufacturing philosophies such as, JIT and lean manufacturing have reduced the need for inventory within the overall logistics chain.
3. Realisation of the fact by the firm that core business can be developed only through increased ROI (Return On Investment) but not merely just from investment in working capital.
4. Due to the rapid technological development, the levels of inventory can be reduced to a great extent. The application of information systems such as POS (Point Of Sales), ERP (Enterprise Resource Planning) plays a crucial role in reducing inventory.

**2.6.1 Role of Inventory Management in SCM**

**Q17** Discuss the role of inventory management in effective supply chain management.

*April-15, Q3(b)*

**OR**

**Critically examine the role of inventory management in supply chain management.**

**Answer :** *(Model Paper-III, Q7(b) May/June-13, Q3(b))*

As supply chain is associated with the flow of activities, information and materials required for producing and distributing outputs to the customers, it requires huge capital investment on plant and machinery, inventories which forming a major portion of firm's operating expenses. Inventory is considered as a major cost of a firm, which is responsible for influencing the levels of customer service.

Inventory management play a crucial role in SCM. The following points shows the role of inventory management in SCM

**1. Improves Customer Service**

It has improved its customer service by providing marketing assistance through which products can be made available to the customers whenever they need them.

**2. Economics of Scale**

It is seen both in production and transportation functions. In case of manufacturing firm, it can be achieved by producing large number of units such that the total cost can be spread over large number of units. Similarly a transportation firm can achieve it by carrying large number of products.

**3. Hedging Against Uncertainties**

It helps in overcoming the problems related to uncertainties. Such uncertainties may be due to demand fluctuations and also due to variations in suppliers replenishment lead times. Such uncertainties can be tackled managed efficiently by investing in safety stocks ensuring the achievements of acceptable service levels.

**4. Hedging Against Contingencies**

Inventory management enables the firms to continue their production process even in case of natural calamities such as cyclones, fires, floods and other problems creating various.

**5. Lot of Size**

It usually refers to the practice of purchasing products in bulk volume which exceeds the demand/consumption rates so as to obtain economies of scale either by offering trade discounts or by causing bulk products per trip of transportation.

**6. Specialisation**

Through the management of stocks, firms could be able to achieve specialisation in their manufacturing activities. After processing of raw materials, they can be transported to different distribution centres. Firms undertake such processes to achieve economies of scale in manufacturing and transportation systems.

**7. Inventory as a Buffer**

As the channel members are distantly located 'buffer stock' has to be kept at various critical interfaces which can be used for safeguarding various processes such as procurement, manufacturing, distribution etc. Thus, the wide-acceptance philosophy of SCM has a profound impact on the flow of inventories throughout the manufacturing and logistics systems.

**2.6.2 Role of Inventory Management in Customer Service**

**Q18** Explain the role of inventory management in customer service.

**Answer :**

Customer service and customer satisfaction are considered as the two important performance indices of SCM. As performance measure acts as an improvement element, it is the responsibility of managers and supervisors to incorporate changes within the organizational climate. Performance measures quantitatively reveal the characteristic features of products, services and processes that produce them.

Performance indicators of the firm need to be realistic and quantifiable (both in financial terms as well as in physical terms). Such indicators need to perform consistently so as to maintain uniformity throughout the supply chain.

Certain circumstances provide improvement opportunities for inventory management. Some of them involve,

1. Increased complaints that have been put forward by customers and distributors leading to increased frequency of order cancellation.
2. Reducing stock turn performance even though large amount of inventory is maintained in the warehouse.
3. Due to the delivery of dissatisfied service level of backorders increases.
4. Shortages of storage space due to excessive inventory holding.
5. Increased investment on dead slow items.
6. Due to technological updations, large number of items become obsolete. Thus, the aforementioned circumstances call for the maintenance of inventory at cost-effective level by introducing several financial and operational measures.

**Financial Performance**

It can be obtained by,

- 1 Increasing the rate of return on inventory investment
- 2 Enhances the performance by increasing the percentage of inventory versus percentage of sales
- 3 Depending on the demand of certain items, they need to be discarded per period
- 4 Decreasing the level of capital that has been consumed by dead, slow items

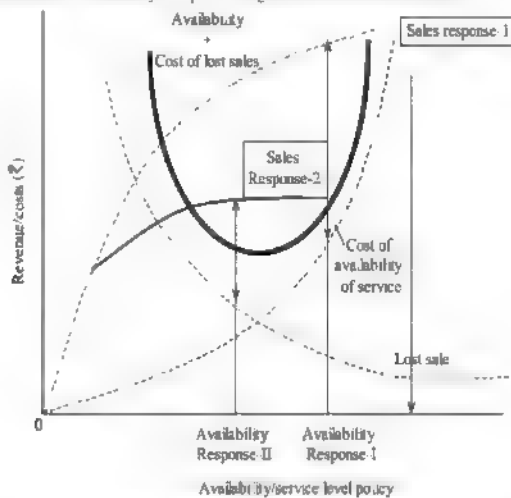
**Operational Performance**

It includes,

- 1 Increasing the service levels of customers over time
- 2 Care must be taken while quantifying the level of inventory
- 3 Customers who have not been serviced need to be identified.
- 4 Increasing sales percentage of stocks by improving the demand and supply relationships.
- 5 Identifying the number of stock outs per period.

After going through the insight of performance indicators, let us discuss about the role of inventory as an element of customer service

In order to determine the relationship existing between the availability of stocks and service costs, firms introduce a graph, which is represented by figure. As, 'availability/service level policy' is a major consideration in managerial decision-making, its formulation requires managerial attention. A proper balance can be maintained by adding "safety stock" to the existing stock levels of firms that are necessary for providing service to the customers



**Figure: Relationship between Availability of Stock and Service Cost**

Figure represents that as service/availability levels move towards 100% availability, there is an excessive increase in the inventory levels due to the availability of safety stock. According to one study, it has been realized that, when availability response was increased from 95 to 97%, there was about 15% incremental increase in stockholding costs. This incremental increase was obtained when firms practiced alternative policies. Some of them are

- 1 Identifying the critical inventory items whose availability can act as a "Convert element" of competitive advantage. Firms need to maintain high levels of such items due to their high demands from customers
- 2 Another alternative could be the usage of efficient mode of transportation as a substitute
- 3 Identifying the rates of sale and demand patterns of different items so as to provide the accession of high levels of high volume, short lead time items close to the customer outlets

**SHORT QUESTIONS AND ANSWERS****Q1. Reverse Logistics****Answer :***(Model Paper-I, Q2 April-15, Q1(c) | May-14, Q1(c))*

Reverse logistics is gaining a wide scope in a present scenario due to the endless generation of waste material, whose recycling and reproducing plays a major role in increasing the profitability of a firm. Today, most of the firms are engaging themselves in reverse logistics activities. The management of reverse supply chain is a difficult task as it is mainly influenced by the planning and forecasting methods. Hence, firm must maintain proper schedules for both planning and forecasting for future products and requirements of the firm. In India, well-organized reverse logistics are practiced by majority of the firms/industries.

**Q2. Physical Distribution****Answer :***May-14, Q1(d)*

Physical distribution is the act of handling, moving and storage of the produced goods from the manufacturing unit to the consumers through various distribution channels. It is the core activity in supply chain management. Peter F. Drucker emphasizes the importance of physical distribution as, "The whole process of business

It considers transportation, facilities, inventory management and information management while formulating a distribution strategy. It is associated with the physical distribution of goods between the various partners of supply chain in such a way that it would reduce the cycle time of customer orders and would increase the service reliability.

**Q3. Outbound Logistics****Answer :***(Model Paper-II, Q1 | May/June-13, Q1(c))*

Outbound logistics is defined as, "Movement of materials associated with storing, transporting, and distributing an organization's goods to its customers."

Outbound logistics serves as a reference to documentation, picking, packing, physical goods issue in warehouse, loading, goods issue posting, advising advanced shipping notifications to business partners and obtaining a proof of delivery from the receiving business partner.

Outbound logistics processing comprises the preparation of goods to be delivered from a warehouse to a receiving location, which is within the scope of warehouse management. Outbound logistics process is supported by the different software packages like SAP/ERP.

**Q4. Define Logistics.****Answer :**

Logistics refers to that part of supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customer requirements.

*- Council of Logistics Management*

Logistics refers to the process that transfers inventory from different sources and positions to the production site for producing goods that are able to meet the customer requirements at the lowest possible cost.

**Q5. List out the objectives of logistics.****Answer :***Model Paper-III, Q4*

The objectives of logistics are as follows.

1. To reduce the cost of operations
2. To make the firms available with the right quantity of right products, at the right place, at the right time and in right condition
3. To maintain transparency in operations
4. To provide the best service to consumers
5. To maintain operational efficiency across the supply chain.

**Q6. What is logistics strategy?****Answer :**

The concept of logistics strategy is not yet evolved completely because of which it has not gained a proper definition. Thus, today, the term “logistics strategy” still presumes differently by different people.

Logistics strategy mainly deals with the determination of performance standards that has to be maintained in an organization. Most of them establishes such standards in terms of service levels and cost objectives. Firms can achieve the desired logistics performance only by maintaining proper trade-offs between cost and service objectives. In order to make it effective, it needs to be integrated with corporate and marketing objectives.

**Q7. Define inventory and inventory management.****Answer :****Inventory**

Inventory refers to the stock of the products that a firm is offering for sale to produce final products. In other words, inventory is composed of assets that can be sold by the firm in the future course of business operations.

**Inventory Management**

Inventory management is of strategic considerations for the firms whose mismanagement increases the working capital requirement across the supply chain thereby increasing the cost burden on one or more agents. The following aspects need to be considered while taking any strategic decision.

1. Type of supplier supplying the component parts.
2. Location and party i.e., from where it needs to be sourced and to where it should be stored.
3. Level of inventory that needs to be available with the firm.
4. Methods through which orders have to be dispatched either directly to the customers or to the intermediaries.
5. Role of information in inventory management.

**INTERNAL ASSESSMENT****I. Multiple Choice**

1. The process of organizing the flow of raw materials, in process inventory, finished goods and related information in a cost effective manner from the point of origin to the point-of-consumption to satisfy customers is usually termed as, [    ]
  - (a) Physical distribution management
  - (b) Logistics management
  - (c) Inventory management
  - (d) Transportation management
2. Materials management is a part of, [    ]
  - (a) Inbound logistics
  - (b) Outbound logistics
  - (c) Integrated logistics
  - (d) None of the above
3. The following are considered as "wings of logistics" transportation, ware housing, materials handling, order processing and [    ]
  - (a) Communication
  - (b) Inventory management
  - (c) On-time product delivery
  - (d) Order cycle time
4. Which of the following are the elements of logistics management? [    ]
  - (a) Transportation
  - (b) Warehouse/storage
  - (c) Packaging
  - (d) All the above
5. \_\_\_\_\_ is an approach to the distribution mission of the firm where by two or more of the functions involved in moving goods from source to user are integrated and viewed as an inter-related system for purposes of managerial planning, implementation and control [    ]
  - (a) Logistics management
  - (b) Supply chain management
  - (c) Integrated logistics management
  - (d) None of the above
6. \_\_\_\_\_ is also termed as physical distribution management. [    ]
  - (a) Inbound logistics
  - (b) Outbound logistics
  - (c) Integrated logistics
  - (d) None of the above

7. According to \_\_\_\_\_, reserve logistics is a process of planning, implementing and controlling the efficient cost effective flow of raw materials, information, finished goods from the point of consumption to the point of origin. [ ]
- Rogers and Tibbon .embke
  - Philip Kotler
  - Peter Mend.
  - None of the above
8. In reserve logistics \_\_\_\_\_ is a difficult task. [ ]
- Profit maximization
  - Inventory control
  - Demand forecasting
  - Sales forecasting
9. \_\_\_\_\_ refers to the stock of the products that a firm is offering for sale to produce final products. [ ]
- Inventory
  - Supply chain management
  - Logistics
  - None of the above
10. \_\_\_\_\_ is mainly responsible for the determination of performance standards that has to be maintained in an organization. [ ]
- Logistics management
  - Logistics strategy
  - Logistics planning
  - None of the above

## II. Fill in the Blanks

- The process of planning, implementing and controlling the efficient flow of goods, services and information for the purpose of achieving customers satisfaction is called as \_\_\_\_\_.
- \_\_\_\_\_ plays an important role in protecting the component parts from damages during transportation of storage.
- Demand forecasting, purchasing, requirements planning and production planning and control are the activities involved in \_\_\_\_\_.
- \_\_\_\_\_ is an important aspect of supply chain management.
- According to \_\_\_\_\_ "competitive advantage stems from the those activities whose performance enables the firm to achieve cost advantage over their competitors which form the basis for differentiation.
- Finished goods inventory, distribution planning, order processing, transportation and customer service are the activities involved in \_\_\_\_\_.
- \_\_\_\_\_ mainly deals with the determination of performance standards that has to be maintained in an organization.
- The logistics strategy enables the firm to determine, how the customer service can act as a supporting force for achieving \_\_\_\_\_ through efficient deployment of resources.
- \_\_\_\_\_ plays an important role in improving the environment and making it "clean and green" by efficiently utilizing the used/waste products.
- Formula for inventory/stock \_\_\_\_\_.

**KEY****I. Multiple Choice**

- 1 (b)
- 2 (a)
- 3 (b)
- 4 (d)
- 5 (c)
- 6 (b)
- 7 (a)
- 8 (c)
- 9 (a)
- 10 (b)

**II. Fill in the Blanks**

- 1 Logistics
- 2 Packaging
- 3 Inbound logistics
- 4 Inventory control
- 5 Michael Porter
- 6 Outbound logistics
- 7 Logistics strategy
- 8 Corporate/Marketing goals
- 9 Reverse logistics
- 10 Cumulative supply – cumulative demand

**III. Very Short Question and Answers****Q1. Define Logistics.****Answer :**

Council of logistics management defined logistics as "that part of supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customer requirement"

**Q2. Write a note on order fulfillment.****Answer :**

Order fulfillment is an important element of logistics management as it mainly strives for reducing the lead time i.e., time taken by the firm from the placement of an order until the products are satisfactorily delivered to the customers

**Q3. What is direct control environment?****Answer :**

Direct control environment includes all those activities which are directly affected by the logistics function and also logistics function gets easily affected by these activities

**Q4. Define integrated logistics management.****Answer :**

Integrated logistics management is an approach to the distribution mission of the firm whereby two or more of the functions involved in moving goods from source to user are integrated and viewed as an inter-related system or sub-system for purposes of managerial planning, implementation and control

*Professor Bernard La Londe*

**Q5. What do you mean by outbound logistics?****Answer :**

Outbound is also termed as "physical distribution management" It is defined as the set of processes, systems and capabilities associated with the physical distribution of goods which enhances the firm's ability to serve its customers.

**Q6. What is inbound logistics?****Answer :**

The term 'inbound logistics' refers to all those activities that are found to be associated with the transfer of goods from the suppliers to the manufacturing plant, such that value-added goods can be delivered to the ultimate customers for their final consumption

**Q7. Write about logistics planning****Answer :**

Logistics planning takes place when there is a need of transportation of materials among different entities who are involved in SC. The main objective of logistics planning is to assure that materials are transported from the place of origin to the end user on the basis of setup cost, schedule and quality norms. Logistics planning involves all types of materials such as raw materials both semi-finished goods and finished goods

**Q8. What is logistics strategy?****Answer :**

The concept of logistics strategy is not yet evolved completely because of which it has not gained a proper definition. It mainly deals with the determination of performance standards that has to be maintained in an organization

**Q9. Define reverse logistics****Answer :**

According to Rogers and Tibben-lemble, reverse logistics is a process of planning, implementing and controlling the efficient cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or for proper disposal.

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**Q10 What is Inventory?****Answer :**

Inventory refers to the stock of the products that a firm is offering for sale to produce final products. In other words, inventory is composed of assets that can be sold by the firm in the future causes of business operations

## UNIT

# 3

## Role of Transportation in Supply Chain

### LEARNING OBJECTIVES

After studying this unit, one would be able to understand.

- ❖ The Role of Transportation in Supply Chain Management
- ❖ Various Modes of Transportation
- ❖ Various Factors Influencing the Transportation Performance and Selection of Transporter
- ❖ Concept of Multi Modal Transport
- ❖ Concept of Warehousing and Types of Warehouses
- ❖ Various Warehousing Operations
- ❖ Concept of Warehouse Management System
- ❖ Concept of Third Party Warehousing
- ❖ Meaning and Importance of Material Handling Systems
- ❖ Role of Handling Systems

### INTRODUCTION

Transportation constitutes one of the most important activities of SCM. Transportation is a physical linkage process that is responsible for interrelating focal firm with the other members of supply chain. Logistics manager plays an important role in selecting the best mode of transportation that helps him in reducing the costs and increasing the firm's profitability.

Warehouse forms a trade-off relationship with transportation. In order to meet diversified need of firms, there exists wide variety of warehouses for storage purpose till the final delivery of materials. Efficiency of warehousing operations and decisions are usually influenced by the material handling systems.

Thus, transportation, warehousing and material handling constitute the important activities of SCM without which it becomes very difficult for a firm to maintain effectiveness in supply chain activities.

### 3.1 TRANSPORTATION IN SUPPLY CHAIN

**Q1. Discuss briefly about the role played by transportation in supply chain**

**Answer :**

*Model Paper-I, Q8(a)*

The transportation system is a physical linkage process which is responsible for connecting focal firm with that of suppliers, customers, warehouses and channel members. Supply chain consists of different fixed points through which raw materials, goods and information can be efficiently utilized by temporarily restricting them at these fixed points, so that both transportation and operating costs can be reduced to a great extent. Transportation decisions are mainly influenced by three main factors. They are,

**1. Operational Factors**

It mainly include characteristics of customers, environment product and company

**2. Choice of Transportation**

It is usually affected by load size, density, value, competitive requirements and cost structures.

**3. Channel Strategy**

It deals with the available channels and interfaces within each channel

Transportation is essential for both bringing the purchased goods from suppliers to the production unit as well as during the dispatch of finished goods from producers to customers. Hence, transportation plays an important role in maximizing the profitability of the focal firm by efficiently transferring the goods information between the partners of supply chain.

**The Impact of Transportation on Supply Chain Management**

As transportation is mainly concerned with the movement of goods from point of origin to final point of consumption (during the process), it creates time and place utilities which are the important prerequisites for customer satisfaction and marketing offers. During the process of trade-off analysis, relevant transportation mode is selected based on the scope of transportation/logistics/marketing interface. Time utility is created by the firm when focal firms are able to deliver right products, at the right time to the right customers. However, time utility mainly depends on the ability of the firm as to how efficiently it can deliver the products to customers on time and as to how long it can store them in warehouses, before delivering them to the endusers. On contrary to this place-utility is created when focal firm is able to deliver the products to the right location from where they can reach the customers.

Thus, transportation is essential for delivering products across the supply chain to the right location on right time

The following are the important factors that influences the transportation decisions,

**1. Customer Communications**

Enabled communication systems involve electronic transfer between the different parties of supply chain which helps in maintaining effective communications between customers and suppliers, suppliers and distributors, distributors and retailers etc., such that cycle times of an order can be reduced by fast delivery of goods/information to them. Thus, advanced information systems can be applied for enhancing the efficiencies of transportation

**2. Market Coverage**

Transportation costs along with flexibility, reliability and frequency of products availability holds a major impact on marketing decisions. The characteristics of the product needs to be considered while making transport decisions, where high volume of valuable products require extended delivery systems that are capable of increasing the frequencies of their delivery

**3. Sourcing Decisions**

Low cost transportation mode is required to source materials, component parts from local markets while the extended delivery system/intermodal transportation is required for sourcing system materials, component parts from distantly located markets. While taking sourcing decisions, many large firms conduct trade-off analysis where the required resources and cost associated with their deliveries are considered

**4. Processing/Manufacturing**

Decisions related with the processing/manufacturing locations are mainly dependent on transportation costs.

Example Location of extraction-based industries near their source of raw materials, so that transportation can be made efficient as it encounters low cost of procurement. Similarly, for the products which involve value added activities need to be located near to the customers.

**5. Pricing Decisions**

For most of the firms as transportation cost forms a significant proportion of total product costs, they need to take proper decisions regarding the selection of transportation mode which in turn holds an impact on the price of products. Hence, firms must select only those transportation modes that reduces both cost and distance from the markets.

**6. Customer Service Decisions**

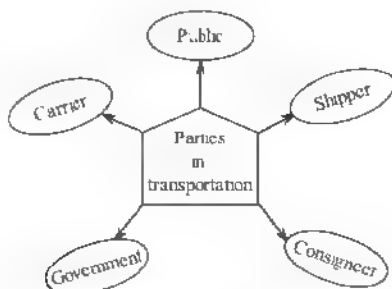
Transportation decisions are also influenced by the method with which customers are being served. Such decisions are also affected by the type of markets in which focal firms are positioning/targeting their products.

**Q2. Who are the different participants in transportation?**

**Answer :**

Participants that are involved in transportation include,

- Shipper
- Consignee
- Carrier
- Government
- Public



**Figure: Parties Involved in Transportation**

All these parties constitute the environment of transportation and each participant plays a significant role in the effective functioning of transportation.

**(a) Shipper**

Shipper is entitled to transfer goods from the origin to destination at minimum possible cost within the stipulated time period. Its services include minimum delivery time, reduced losses and damages to the products and so on.

**(b) Consignee**

Consignee is the receiving party of the objects from the shipper.

**(c) Carrier**

Carrier is the medium through which a shipper can transport the goods to the consignee. Carrier aims at minimizing the cost of transportation thereby maximizing the profits of the suppliers.

**(d) Government**

Government formulates various regulatory and promotional programs for improving the transportation activities as they have a considerable effect on economic growth of nation. The objective of government is to expedite the shipment of goods at reasonable cost.

**(e) Public**

The diversified need for transportation across the countries is mainly determined by the public demand for goods at low price. Most of the transportation decisions have to be made by considering the public expectations.

It is necessary to maintain harmonious relationships among the various participants for information sharing as proper information flow in addition to material flow is also very important for the effective management of transportation.

**3.1.1 Transportation Formats****Q3. Explain transportation formats in supply chain.****Answer :**

Under certain circumstances the functions of different participants of transportation may overlap. Such as if a shipper has a private fleet he does not require separate carrier for the movement of goods from one place to another. Thus, in this case shipper performs dual functions of an originating party (sender of goods) a "carrier" of goods. There are three common ways through which a shipper can satisfy his/her transportation requirements,

- (a) Private fleet
- (b) Contract carrier
- (c) Common carrier

Each transportation format can be discussed as follows,

**(a) Private Fleet**

A private fleet is a transportation format in which firms/shipper possess their own transportation carriers. Private carriers are owned by the firm and are not subjected to the terms and conditions of hire purchase and economic regulations. But they should comply with the rules and regulations prescribed by the government authorities. Some of them includes, avoiding the movement of hazardous goods, following vehicles pollution norms, safety and so on.

Firms with private fleet should either own their carriers or have the carriers on lease. The carriers must be controlled and managed by the firms/shipper.

**Example**

The trucks used by the SIA publications and distributors forms an example for private fleet.

Private fleet should operate in line with the firm's operations. Unlike hiring the carriers, private fleet is costlier for transporting goods to long distances. Because of this reason, most of the firms are preferring the hiring option instead of purchasing or leasing them.

**(b) Contract Carriers**

Contract carriers offer transportation services to a number of shippers based on a predetermined contract or agreement including the rate at which service is provided along with other terms and conditions. This agreement represents the permit for transportation of commodities through the carriers.

**Example**

Transportation services provided by specific agencies based on a contract is an example of contract carrier.

The rates for transportation carrier differ from one shipper to other and it depends on the level of transportation services required for the shipper. Contract carriers are more economical than the private fleet because,

- (i) The cost of service does not represent the fixed cost of a vehicle.
- (ii) It does not include maintenance cost of vehicles.
- (iii) Contract carriers will offer better and consistent services than private fleet as they are engaged only in those transportation services which are found to be efficiently dealt by them.

**(c) Common Carriers**

Common carrier is most commonly a public transportation carrier.

**Example**

Indian Railways is a common carrier mostly used in India.

These carriers provide transportation services to public at an affordable price without any discrimination in prices. Common carriers are most economical and also best suitable for transporting heavy loads to different places where road system is not well developed.

**Example**

Industries producing coal use Indian Railways for transportation.

### 3.1.2 Modes of Transportation

**Q4. List and discuss the various modes of transport in SCM. (Model Paper-III, Q8(a) May/June-16, Q4(a))**

**OR**

**Explain the various modes of transportation in SCM**

**Answer :**

*May/June-12, Q4(a)*

Basically, logistics manager makes use of five different modes of transportation, based on the geographical location and the nature of products that has to be transported. Each mode has its own features like cost and time requirements which differs from one mode to another. Following are the five basic modes of transportation,

- i) Railways
- ii) Roadways
- iii) Airways
- iv) Waterways
- v) Pipelines

#### (i) Railways

Railways are primary long-distance, large volume movers that are usually engaged in transferring low value high density goods. A major advantage of this mode lies in its ability to transfer a bulk of goods (large volume of goods) at considerably low cost than transferred by any other modes of transportation.

#### Advantages of Railways

- 1 It helps in achieving economies of scale where average production cost can be reduced by producing bulk quantities of outputs such that per unit cost can be lowered by spreading fixed cost over large volume of output.
- 2 It is capable of transferring large volume of high density goods.
- 3 Among other modes of transportation, it is found to be associated with lowest cost per ton-mile.
- 4 It also provides other services along with the basic purpose of transportation such as reliability and safety.
- 5 It also enables the firm to enhance their profitability by adopting various market penetration strategies.
- 6 It is faster and cheaper mode of transportation when compared to any other mode.

#### Disadvantages of Railways

- 1 It is a costly process if the distance between the manufacturer and supplier increases.
- 2 It is characterized by low accessibility. 'Accessibility' is a term generally used to describe the ability of a carrier to provide service to and from the source to the destination.
- 3 It is a slow process and requires relatively high time for performing its operations.
- 4 It has to follow fixed path along the railway tracks without following any shortest alternative route.

#### (ii) Roadways

They constitute the most common means of transportation. Motor carriers are capable of operating under all types of infrastructures; they can be operated by a publicly maintained highway by exercising small investments in these assets. They are suitable and are the most favourable method for handling small shipment orders.

#### Advantages of Roadways

- 1 It is one of the simplest methods used by logisticians for the transfer of goods.
- 2 Its cost structure is characterized by low fixed cost and high variable cost.
- 3 Infrastructure and financial facilities are provided by government through tax charges and licensing fees.
- 4 They are mainly engaged in transferring both high and low value products to distantly located geographical areas.
- 5 Certain large trucking companies are also offering multiple logistics services by outsourcing the main functions of logistics.

#### Disadvantages of Roadways

- 1 It is a costly affair as it involves a series of small carriers for the movement of goods.
- 2 Huge amount of capital is required to establish the motor carrier industry.
- 3 It is associated with the fulfillment of only small shipment orders.
- 4 Driving regulations can cause delays.
- 5 Bad weather may act as a major obstacle during the on-time delivery of goods.

#### (iii) Airways

It is found to be the newest and recently utilized mode of transportation. This is mainly used for the delivery of fragile and non-bulky/light weighted goods from the distant suppliers. Even the delivery of highly demandable scarce products finds ways in air freighting.

**Advantages of Airways**

1. Its major advantage lies in its ability to transfer goods in a very short span of time (speed delivery)
2. Its fixed cost is relatively lower than other modes while its variable cost increases due to the excessive usage of fuel, labour efficiencies etc
3. It is associated with reduced lead time
4. Improves service levels as customers need not wait for long time for the fulfilment of their service orders

**Disadvantages of Airways**

1. It is expensive
2. It has to suffer from customs and excise regulations.
3. Reliability is less
4. It is not suitable for transporting heavy and bulky goods
5. If met with an accident, there may be huge loss of goods, property and life

**(iv) Waterways**

If the movement of goods takes place through lakes, canals and navigable rivers, it is said to have been transferred through waterways. It is the oldest mode of transportation. It is primarily used to transfer low value and high density goods that can be easily loaded or unloaded. Usually minerals, agricultural and forest products can be transferred with the help of such waterways

**Advantages of Waterways**

1. Its main advantage lies in its ability to move large shipments
2. It is an economic mode of transportation for bulky and heavy goods.
3. It does not require much investment in maintaining and constructing routes as most of them are naturally made
4. It helps in the promotion of international trade

**Disadvantages of Waterways**

1. It involves extended transit times and low accessibility
2. It is usually affected by adverse weather conditions
3. As it is a slow moving transportation mode, perishable goods cannot be moved by this mode
4. It is more prone to the theft and loss of goods

**SIA PUBLISHERS AND DISTRIBUTORS PVT LTD.****(v) Pipelines**

Pipelines is the most economical and convenient mode of transportation required for the transfer of water, petroleum and natural gas. It is the only mode which is operating on '24 x 7' basis. It is associated with high fixed cost while its operating costs is found to be lower than other modes.

**Advantages of Pipelines**

1. Low cost of operations
2. Usually remains unaffected by weather conditions

**Disadvantages of Pipelines**

1. It requires large amount of initial investment for maintaining and installing the pipelines
2. Its accessibility is restricted to only those shippers that are located adjacent to the pipelines

**3.1.3 Factors Affecting Transportation Performance**

**Q5. Explain about the factors affecting the transportation performance in SCM.**

*June-17, Q4(a)***OR**

**What are the factors influencing the performance of transportation system?**

**Answer :***April-15, Q4(a)*

The firms need to maintain an effective transportation system which can reduce the costs and time and can provide quality services to the customers. The factors that affect the performance of transportation system are as follows,

- (a) Cost
- (b) Speed and
- (c) Consistency.

**(a) Transportation Cost**

The cost of transportation is one of the important factors which affects the performance of the transportation system. The transportation cost includes the cost incurred for the shipment of goods from one location to other location and the maintenance costs. The firm should select the transportation system which minimizes the total transportation cost.

**(b) Transportation Speed**

Like cost speed is also an important factor which has a significant impact on the transportation performance. The speed of a transportation system represents the time required for the shipment of goods from one location to other location or from source to destination. The selected transportation system should reduce the total time required for shipment of goods.

**Relation between Cost and Speed**

The two factors speed and cost are related in the following two ways,

- (i) The transport firms providing faster transportation services charge high rates for their services.
- (ii) The faster the transportation speed the lesser will be the cost required for the in-transit maintenance of inventory.

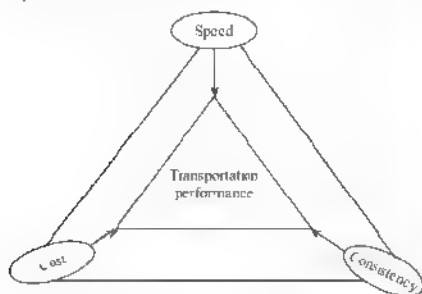
For selecting effective and economical transportation, the firm should trade-off between the cost and speed required for the transportation system.

**(c) Consistency**

Consistency means maintaining a pace in the transportation speed of the goods. It is necessary for a firm to maintain consistency in its transportation system i.e., the speed should be maintained consistently with the supply for providing quality services to the customers. Consistency is considered as the most significant aspect of transportation which highlights the quality of the system.

If the transportation of the goods from source of destination for the first time takes two days' time and four days' time for the next time then this shows lack of consistency in the transportation system. This in turn leads to complex problems in the continuous flow of supply chain. In the absence of consistency, the firm should maintain safety stock for protecting it against the service breakdowns.

In the present environment, with the introduction of sophisticated techniques, the firms can control the variances in the transportation system for maintaining consistency in its performance.



**Figure: Factors Affecting the Performance of Transportation System**

Thus, it is necessary for a firm to select and manage a suitable and desired transportation mix for the continuous flow of goods across the supply chain of the firm.

**3.1.4 Factors Influencing the Selection of Transporter**

**Q6. Explain the factors influencing the selection of transporter.** *May-14, Q4(a)*

**OR**

**What are the factors influencing selection of transporter in supply chain management?**

**Answer :**

*May/June-13, Q4(a)*

Slater has established an approach for selecting an appropriate mode of transportation. According to which, selection of transportation mode is usually influenced by the following factors,

1. Company features and its philosophy
2. Market structure
3. Product features
4. Customer characteristics
5. Environmental issues

Each factor can be dealt in detail, as follows.

**1. Company Characteristics and its Philosophy**

Company's marketing, financial and operational strategies constitute the characteristics of a company. The marketing strategies mainly deal with the customer service offer and performance of service. While, the financial strategies are mainly concerned with the fulfilment of profit objectives that is usually represented by the financial structure decisions. According to these structural decisions, non-core activities need to be reduced unless they are required for delivering effective services.

Even, the operational structure of firms play an important role in the economical and effective delivery of outputs in the present competitive markets by performing continuous production processes. Most of the firms are giving primary importance to the transport function of logistics management which requires increased service responsibility through centralized manufacturing.

**2. Market Structures**

Market structures and their geographical locations hold a major impact on the transportation costs. Based on the nature of market structures, they have been classified into two types namely, the competitive structure and the geographical or territorial structure. In case of highly competitive market, efficient and fast delivery of goods to the customer is a driving force for achieving high levels of customer satisfaction, which in turn affects the transport decisions.

**3. Product Characteristics**

Firm's products are characterized by weight, size, shape, robustness, value and many other unique features which influence the transport decisions.

**Example**

"Special purpose, expensive, heavy load products" specialists like trucks are required to transfer loaded machines and heavy tools and equipments whereas chilled or refrigerated vehicles are used for the safe transfer of medicines and vaccines. Hence every firm must consider each and every aspect of product before making any final selection of transportation mode.

**4. Customer Characteristics**

Before selecting target customers, every firm needs to be well accessed with the profile and characteristic features of the customers to whom they might be serving because their characteristics and nature of orders influence the profitability of business. Depending on these characteristics, firms must decide whether to deliver a product directly to customers or to some retail outlets, based on the cost and benefit associated with each alternative.

**5. Environmental Issues**

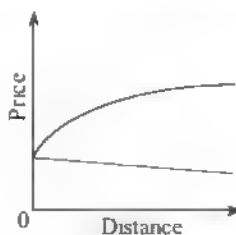
Various environmental issues like trade barriers, policies, regulations and deregulations impose a drastic impact on the transportation costs. Transportation modes used by a domestic firm is entirely different from that used in international operations.

Unlike inventory investment, where firm needs to invest in stocks to optimize the level of inventory, transportation decisions can be made without initial investment through leasing, hire-purchase and by outsourcing transport functions from some other service company.

Other important factors influencing the selection of transportation modes includes,

**(i) Distance**

As distance is directly related to the variable cost, it mainly influences transportation cost. This relationship can be well understood with the help of a curve.



**Figure: Relationship between Variable Cost and Distance**

Initially, the cost curve does not show any variation as it is associated with only fixed cost due to shipment pickups and delivery which are found to be independent of the distance travelled. The curve is upward moving but at decreasing rate. This effect is due to the fact that as soon as the distance increases, efficiency of operations also increases i.e., the utilization of fuel, labour and other variable overhead increases which decreases the cost per unit distance even though there is an increase in the total cost of outputs.

**(ii) Cost**

It mainly considers the direct cost i.e., the cost incurred by the firm during the movement of goods from one region to another and the indirect costs associated with in-transit inventory. Hence, firms must select only those transportation modes that are found to be associated with low cost of movement because it is not a ways possible to maintain low cost of movement of goods by using least expensive transportation mode.

Thus, all the above factors need to be considered while making decisions regarding the selection of transportation mode.

**3.2 MULTIMODAL TRANSPORT**

**Q7. Explain briefly about multimodal transportation. State its benefits and limitations**

**Answer :**

*Model Paper-II, Q8(a)*

**Multimodal Transportation**

Multimodal transportation is a type of transportation system which uses more than one mode of transportation for shipment of materials equipments from source to destination. It involves the use of more than one means of transport such as a combination of rail, truck, aeroplane, ship etc. With an increase in the transportation flexibility and increase in international shipping, there has been an increase in the use of multimodal transport system. The multimodal transportation allows the free movement of materials or equipments between different modes. While selecting the transportation mode the organization should consider the following factors,

- (i) Nature and value of materials
- (ii) Time and distance for transportation
- (iii) Costs of transportation
- (iv) Stability of a carrier
- (v) Material security, loss and damage
- (vi) Availability of special facilities
- (vii) Delivery schedule

The use of transportation modes differ from one market to other market. The performance of different modes of transportation is outlined in the following table

Parameters	Modes				
	Railways	Motors	Water	Air	Pipeline
Cost	3	4	2	5	1
Transit time	3	2	4	1	
Reliability	2	1	4	3	
Capability	1	2	4	3	5
Accessibility	2	1	4	3	
Security	3	2	4	1	
1 Best performance					
5 Worst					

**Table: Performance Rating of Modes by Selection Determinant**

The following are the different combinations of transportation modes which provides intermodal services

- (i) Rail-truck
- (ii) Rail-water
- (iii) Rail-air
- (iv) Rail-pipeline
- (v) Truck-air
- (vi) Truck-water
- (vii) Truck-pipeline
- (viii) Water-pipeline
- (ix) Water-air
- (x) Air-pipeline

But all these combinations are not feasible for transportation. Out of all these modes, only rail-truck or piggyback, and water-truck or fishyback are feasible to a large extent and truck-air and rail-water are acceptable to some extent.

It is not possible for a firm to transfer the products using the same mode for a long distance. So, the firms/suppliers should make use of multimode transportation systems using different modes.

#### Example

For shipment of materials from Andheri to Bangladesh, firstly the firm needs to use trucks for transportation of materials from factory to Bombay port and then it must use ship till Bangladesh port and from there again trucks must be used for movement of materials from port to customers in Bangladesh.

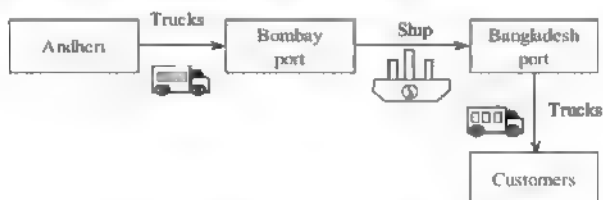


Figure: Intermodal Transportation

Multimodal transportation helps the firms to obtain benefits by combining different modes of transport.

A supply chain manager should assess the advantages and disadvantages of each mode and should select the most suitable combination in order to reduce the transit time and cost. Most of the suppliers opt for water and rail services as they provide low-cost advantages and have easy accessibility.

#### Benefits of Multimodal Transportation

The following are the advantages of multimodal transportation,

- (i) Multimodal transportation maximizes the benefits of using different modes.
- (ii) It minimizes the transit time.
- (iii) It reduces the transportation cost.
- (iv) It provides a flexible means of transportation between different modes.

#### Limitations of Multimodal Transportation

The limitations of multimodal transportation are as follows,

- (i) It needs greater coordination and synchronization between different modes/carriers involved in multimodal transport system.
- (ii) Multimodal transportation takes significant amount of time while transferring the freight from one mode to other mode.
- (iii) It sometimes create delays and increases the transportation costs.

### 3.3 WAREHOUSING – TYPES OF WAREHOUSES

**Q8. What is warehousing? Discuss the role of warehousing (stores management) in supply chains.**

**Answer :**

#### Warehousing

A warehouse is a point in the logistics system where a firm stores or holds raw materials, semi-finished goods or finished goods for varying periods of time. In the macroeconomic sense, warehousing performs a vital function. It creates time utility for raw materials, industrial goods and finished products. The proximity of market-oriented warehousing to the customer allows a firm to serve the customer with shorter-lead times. Thus warehousing function continues to be increasingly important as companies and industries use customer services as a dynamic, value-adding competitive tool.

**Role of Warehousing (Store Management) in Supply Chain**

In case of small enterprise, a single person is usually responsible for the management as well as for the control of stock throughout the organization but as the volume of stock increases, its management becomes a difficult task for a single person. Hence, for large enterprises more number of store personnel are required which are headed by the stores manager. Efficient stores management provides the following advantages.

1. Increases the value of stock when compared to all other possessions of an enterprise
2. Helps in the prevention of tying-up of huge amount of working capital with less valuable items
3. Enables the enterprise to carry out its operations smoothly by efficiently maintaining the stocks of important items
4. Helps in increasing the profits of an enterprise by keeping the stocks of more demandable goods in excess when compared to other items, which also helps in the retention of old customers along with the attraction of new ones
5. Maintains protective environment ensuring that the stocks are kept in safe conditions
6. Helps in availing the pricing advantage for seasonal products
7. Allowing the firms to purchase in bulk quantities
8. Provides maximum stock keeping services to the manufacturing and sales personnel at least cost

**Q9. Discuss in detail about types of warehouses and warehousing operations.**

**Answer :**

*(Model Paper-I, Q8(b) | April-15, Q4(b))*

**Types of Warehouses**

Based on diversified needs, wide variety of warehouses exists. But in practice public warehouse possess a standardized services in comparison to private warehouses. Following are the different types of public warehouses.

**1. Commodity Warehouses**

Such warehouses are used to handle and store perishable commodities such as lumber, cotton, tobacco, grain and other similar products that can be spoiled easily

**2. Bulk Storage Warehouses**

These warehouses are concerned with the storing and handling of bulky products such as highway salts, liquid chemicals, syrups and oils

**3. Household Goods Warehouses**

Storage and handling of household goods and furniture are the main activities of such type of warehouses

**4. General Merchandise Warehouses**

These are the common warehouses deals with the buying and selling of goods which do not require any specific handling mechanism

**5. Mini Warehouses**

Size of these warehouses is limited usually designed as extra space and renders only few services. Even though is a convenient location it lacks security

**6. Temperature Controlled Warehouses**

The main purpose of these warehouses is to maintain and control its environment such that suitable environment must be established which is favorable for the storage of perishable products such as frozen foods, fruits, vegetables, drugs and chemicals

Depending on circumstances, firms are using either a single warehouse or a combination of two or more warehouses for the storage of goods

**Warehouse Operations**

For answer refer Unit-III, Page No. 3.12, Q No. 10

### 3.3.1 Warehousing Operations

Q10. Discuss briefly about warehousing operations.

Answer :

Warehousing operations has been broadly categorized into two types as in figure (1)

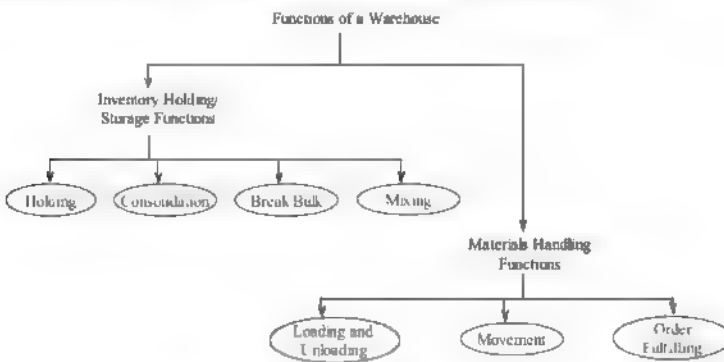


Figure (1)

#### 1. Inventory Holding/Storage Functions

Storage functions are mainly concerned with the accumulation of inventory over a specific time period. They are, mainly influenced by local time stipulations and so on. Storage functions can be studied under the following sub-types

##### (a) Holding

Holding facilitates the proper arrangement of goods in a warehouse, so as to protect them against uncertainties. Characteristics of inventory plays a vital role in determining the duration of time required for the holding goods in storage. Different types of storage systems are available for different types of products i.e., specialized long-term storage can be used for wines, liquors whereas general purpose merchandise storage is used for storing seasonal goods.

##### (b) Consolidation

If the products are collected from various sources, firm must implement a single large distribution centre which is helpful in combining various small shipments as shown in the following figure (2).

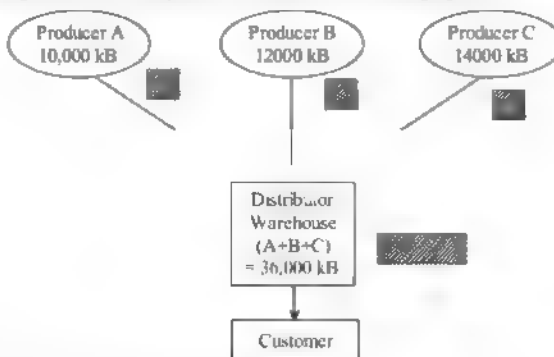


Figure (2)

Such distribution warehouse is different from holding warehouse where long term storage is practised while holding warehouses are meant for temporary storage. It is also helpful in depicting how a holding warehouse should allocate its space for different products.

A warehouse which concentrates mostly on receiving and shipping activities eliminating storage and order picking activities are referred to as "Cross docks" "Pool points". In such warehouses, goods can be easily transferred within 24 hours inbound to outbound centres without storing them.

### (c) Break Bulk

The procedure of break bulk is completely opposite to the procedure of consolidation. It is found to be the most favorable mode for the storage of volume shipments. This method is applied for the transfer of goods when the quantity ordered by the customer is less and also when the distance between the customer and producer is more. It is commonly seen in terminal or distribution warehouse, particularly when the per unit rate of inbound transportation is less than the per unit rate of outbound transportation as in figure (3).

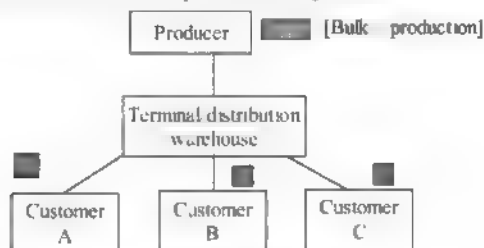


Figure (3): Break Bulk Storage

### (d) Mixing

The demand of the customers cannot be accomplished fully by a single producer. Therefore, to satisfy the customers, firms must gather stores (different products from wide range of producers) and mixed them at a common point usually referred to as "mixing point" so as to fulfil the customer order as in figure (4). In the absence of mixing facility, customer receives inadequate quantity at high transportation cost which has to be avoided.

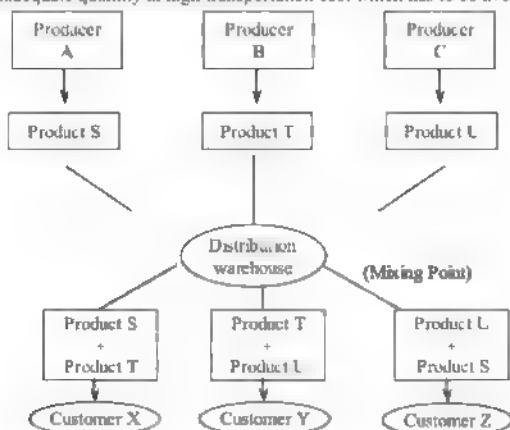


Figure (4)

## 2. Materials Handling Functions

For answer refer Unit-III, Page No. 3-18, Q No. 16.

**Q11. Describe various types of storage alternatives available to the logistician in evaluating his logistics system design.**

**Answer :**

#### **Storage Alternatives**

Several financial and legal arrangements are possible for the storage of goods. To design a perfect logistics system various alternatives are available. Based on financial assistance, they have been broadly categorized into four types

##### **1. Space Ownership or Private Warehousing**

Some organizations whether dealing in production or service sector invests huge amount of capital for owning storage space which entails them the following benefits

- (i) Huge earnings can be accrued from the ownership of real estate
- (ii) If the space is purchased privately, then it can be optimally utilized for reducing various cost overheads.
- (iii) In future, the same space can also be utilized for some other purpose too
- (iv) Effective warehousing enables to render high degree of service
- (v) Space can also be utilized as private truck fleet, purchasing department or sales office
- (vi) For specialized products such as pharmaceuticals, other chemicals, private ownership is the only alternative

Thus, it has been seen that private warehousing is found to have an upper hand over rented or leased warehouse

##### **2. Rented Space (Public Warehousing)**

Many firms specifically operate warehousing as a separate business. Such firms may act both as service providers and also as public warehouse. Public warehousing is similar to private warehousing and deals with receiving, storage, shipping and other related activities.

##### **3. Leased Space**

This facilitates the firms to select a best alternative between private warehousing and public warehousing. When firms possess long-term obligations then it has to choose private warehousing, whereas if firms have short-term obligations to fulfill, then it can opt for public warehousing. The basic advantage of leasing is that firms can process space from the owner at a low rate

#### **4. Storage in Transits**

"Storage in transit" refers to that time when goods remain in/with the transportation vehicle during their delivery to the warehouse. It is a special form of warehousing which is mainly dependent on the mode of transportation. As, each transportation mode has its distinct transit time, firms must select only those mode that are capable of reducing the transit duration

**Q12 "Public warehouses are much more beneficial than private warehouses". Discuss.**

**Answer :**

Public warehousing/rented warehouse space is found to be more advantageous than private warehouse space. Some of its main advantages are as follows.

##### **1. Absence of Fixed Investment**

Public warehousing does not involve any fixed investment if the firm has to acquire a rented space. Firms using rented space do not have to incur direct costs but its expenditure is mainly influenced by the extent of service provided by the warehouse

##### **2. Reduced Cost of Operation**

Cost of public warehousing is comparatively less than either based or private warehousing. This is due to the fact that both leased and private warehouse encounters capacity problems which causes either under or over utilization of warehouse space. Such problems can be overcome by using public rented warehouses as they help in optimum utilization of storage space

##### **3. Location Flexibility**

As public warehouse is a rented space, its location can be easily changed depending on the market trends. It is inexpensive and focuses mainly on the fulfillment of short-term obligations. This feature of meeting short-term obligations provide greater flexibility which is a prerequisite for establishing an optimal logistics network

##### **4. Services**

Public warehouses offer wide variety of services to gain a strong position in a market. In addition to its basic services such as storing, handling, receiving shipping and consolidating it also provides other services. Some of them are

##### **(a) Bonding**

It establishes bonding arrangements between a merchandiser and the government on account of the transfer of goods such as tobacco, teakwood, wines etc., on which taxes or duties are levied

**(b) Field Warehousing**

t acts as one of the financing method through which working capital can be increased by a third party or a public warehouse man wherein, a third party leases a portion of the private warehouse consisting of stored goods from the owner of goods and issues a warehousing receipt which acts as a guarantee for the owner of goods while seeking bank loan.

**(c) Stock Spotting**

It is an extension of break bulk function in which producers are engaged in spotting an assortment of their inventories in public warehouse, located near to their markets, public warehouses offer this type of services only to meet the increased demand of customers.

**(d) Documentation and Legal Considerations**

Public warehouses are accountable for safeguarding the public property. American warehouseman's association has highlighted a following section on liabilities from the terms and condition of a standard contract.

"The warehouseman should not be liable for any loss or injury to goods stored however caused unless such loss or injury resulted from failure by the warehouseman to exercise such care in regard to them as a reasonably careful man would exercise in circumstances, and the warehouse and is not liable for damages which could not have been avoided by the exercise of such care."

The above statement explains that public warehouse man is accountable for taking adequate care in handling and storage of goods. In spite of his extensive care, if the goods get damaged then warehouse man is not liable.

In order to run a public warehousing smoothly, various types of documents such as warehouse receipt, bill of lading, the over short and damage report and inventory status report are essential.

**5. Warehouse Receipt**

This is a primary document and possess the details of what kind of goods are stored, at which location, person who owns the goods, to the person the goods need to be transferred and terms and conditions of the contract specified by uniform warehouse receipts act.

Warehouse receipts may be negotiable or non-negotiable. In negotiable, goods can be transferred to any person who possess the receipt. Whereas in non-negotiable, goods are transferred only to the designated person.

**6. Bill of Lading**

It is a document which discloses all the terms and conditions while transferring the goods.

**7. The Over, Short and Damage (OS and D) Report**

When the goods have not arrived in a proper condition, then the OS and D report is issued. It is basically to file a claim.

**8. Inventory Status Report**

It shows the details of products, items weight and quantity for every month so as to evaluate the inventory position.

**3.4 WAREHOUSE MANAGEMENT SYSTEM****Q13. Discuss briefly about warehouse management system.**

**Answer :**

**Warehouse Management System**

A Warehouse Management System (WMS) is a software application used to control the day-to-day activities of a warehouse. The Warehouse Management System (WMS) has been evolved in the same manner as that of the other software solutions. Initially, its scope was restricted to only control, storage functions. Later, it has been widened to include the light manufacturing, transportation management, order management and other accounting systems.

Evolution of WMS can be compared with Material Requirements Planning (MRP) which is basically designed for planning the raw materials but later evolved into the MRP-II Manufacturing Resource Planning. MRP-II is an updated and automated version of MRP I with additional features of scheduling and capacity planning. After that ERP has evolved from MRP-II include some additional functions along with the core activities of MRP II.

Similarly, WMS also being evolved continuously in order to bring improvement in its functionality. Initially, WMS was designed to manage and control the storage of goods along with directed picking and replenishment activities. Later the functionality of WMS can be further improved through the addition of other functions such as gathering information regarding the orders, location, item, quantity etc., so as to decide the location for storage, retrieval and order scheduling.

**Benefits of WMS**

Generally, the WMS yields the following benefits:

- Reduces inventory
- Bring reduction in labour cost
- Increases the storage capacity
- Helps in improving the customer service and
- It also plays a vital role in increasing the accuracy of inventory levels

Though WMS yields number of benefits, firm has to assess these benefits with the costs incurred for installation and maintenance of WMS (Warehouse Management System). The main objective of a warehouse management system is to control the movement and storage of materials. As, it is complex, data intensive and application oriented system, it requires lot of resources and data management and a separate IS department for analyzing and maintenance and also costlier compared to other software system.

#### Reality of WMS Performance

In General, WMS is said to yield the benefits mentioned above. But in real sense WMS yields accuracy in inventory, minimizes the labour cost and reduces the cycle time which in turn improves the efficiency of a customer service. The other benefits such as increased storage capacity and reduced inventory are difficult to gain in practical implementation of WMS. This is because increase in inventory accuracy may lead to the reduced safety stock levels which does not have any significant effect on the level of inventory. Warehouse Management System (WMS) does not have any important effect on the factors controlling the inventory levels of a warehouse.

Firm has to implement the WMS if the existing warehousing system is unable to improve the customer services.

#### Functions of WMS

WMS perform the following functions.

##### (i) Integration with Automated Materials Handling Equipment

WMS allows the integration of automated tools and machinery with the automated materials handling equipment for efficiently handling and controlling the system.

##### (ii) Use of Advanced Shipment Notifications

WMS makes use of (ASN) Advance Shipment Notification in order to receive the stock automatically after identifying the labels attached by the vendors to do the shipments.

##### (iii) Cycle Counting

WMS also perform the cycle counting function in order to operate the specific activities by modifying the cycle counting, if necessary.

##### (iv) Labour Tracking and Capacity Planning

WMS also used for labour reporting and capacity planning by providing a setup for recording standard and available machine and labour hours per task and per shift. These data helps the WMS in planning the capacity and load and also in reporting productivity of the firm.

##### (v) Activity-based Billing

WMS also serves the function of activity-based billing in which an individual determines the fees based on the specific activities of the warehouse. It is specifically designed for third party logistic operators.

##### (vi) Browser-based

WMS can be performed by using browser-based approach more effectively than any other software system. All these functions of WMS mostly benefits the 3PL operators.

### 3.5 THIRD PARTY WAREHOUSING

**Q14. Write a note on third-party warehousing. What are the types of third party warehousing?**

**Answer :**

#### Third-party Warehousing

The companies which are not able to build warehouses to store the inventory on their own are moving towards the third-party warehousing. In this third-party warehousing, a third party provides warehousing services to the firms. All these changes in warehousing are in accordance with the increase trade, competition and technological advancement.

Third party services are offered by state warehousing corporations and other public sector undertakings such as Central Warehousing Corporations (CWC), public state warehousing corporations and others. Out of all these corporations the most dominant service provider of warehousing is CWC which carry out its operations by 444 warehouses and has a storage capacity of 7.3 million tones. It performs different types of warehouse activities for storage of specific items including:

- (i) Food grain warehouses
- (ii) Customer bounded warehouses
- (iii) Inland clearance depots
- (iv) Container freight station, and
- (v) Air cargo complexes.

#### Types of Third-Party Warehousing

Third-party warehousing is categorized into three types i.e.,

- I. Private warehousing
- II. Public warehousing and
- III. Contract warehousing.

##### I. Private Warehousing

Some organizations whether dealing in production or service sector invests huge amount of capital for owning storage space which entails them the following benefits,

- (i) Huge earnings can be accrued from the ownership of real estate
- (ii) If the space is purchased privately, then it can be optimally utilized for reducing various cost overheads.
- (iii) In future, the same space can also be utilized for some other purpose too
- (iv) Effective warehousing enables to render high degree of service
- (v) Space can also be utilized as private truck fleet, purchasing department or sales office
- (vi) For specialized products such as pharmaceuticals, other chemicals, private ownership is the only alternative

Thus, it has been seen that private warehousing is found to have an upper hand over rented or leased warehouse

#### II. Public Warehousing

Many firms specifically operate warehousing as a separate business. Such firms may act both as service providers and also as public warehouse. Public warehousing is similar to private warehousing and deals with receiving, storage, shipping and other related activities.

##### Advantages of Public Warehousing

Public warehousing/rented warehouse space is found to be more advantageous than private warehouse space. Some of its main advantages are as follows.

##### 1. Absence of Fixed Investment

Public warehousing does not involve any fixed investment if the firm has to acquire a rented space. Firms using rented space do not have to incur direct costs but its expenditure is mainly influenced by the extent of service provided by the warehouse

##### 2. Reduced Cost of Operation

Cost of public warehousing is comparatively less than either based on private warehousing. This is due to the fact that both leased and private warehouse encounters capacity problems which causes either under or over utilization of warehouse space. Such problems can be overcome by using public/rented warehouses as they help in optimum utilization of storage space.

##### 3. Location Flexibility

As public warehouse is a rented space, its location can be easily changed depending on the market trends. It is inexpensive and focuses mainly on the fulfillment of short-term obligations. This feature of meeting short-term obligations provides greater flexibility which is a prerequisite for establishing an optimal logistics network.

#### 4. Services

Public warehouses offer wide variety of services to gain a strong position in a market. In addition to its basic services such as storing, handling, receiving, shipping and consolidating it also provides other services. Some of them are, bonding, field warehousing, stock spotting, documentation and legal considerations.

#### 5. Warehouse Receipt

Warehouse receipts may be negotiable or non negotiable. In negotiable, goods can be transferred to any person who possesses the receipt. Whereas in non negotiable goods are transferred only to the designated person.

#### 6. Bill of Lading

It is a document which discloses all the terms and conditions while transferring the goods.

#### III. Contract Warehousing

In contract warehousing, warehouse services are provided by a third party to the firm based on the predetermined agreement or contract. Most of the firms are now choosing contract warehousing as it is very economical.

It is very essential for the firms, to review their warehouses continuously as there are rapid technological advancements. Thus, it plays an important role in the successful performance of the organization and in determining the industry competitiveness.

### 3.6 HANDLING SYSTEMS – CONCEPT AND IMPORTANCE

**Q15. What is material handling? State its functions and importance.**

**Answer :**

*Model Paper-II, Q4(b)*

#### Material Handling

Material handling involves all those activities that are responsible for the efficient movement of goods, either within a plant or a warehouse or between a plant and a transportation agency.

Material handling is defined as the manual or mechanical movements of the material between various work stations in a plant, either individually or in batches with the help of various Material Handling Devices (MHDs).

Movement of materials in an industry can be vertical, horizontal or both. Such movement initiates from the procurement of raw materials to the ultimate delivery of final products. For example, raw materials are manually loaded into a hopper which is then transferred into a mixer by pneumatic means. Granules from the mixer are initially transferred into a mill by pneumatic means and then into a blender.

Various MHDs collectively form a *material handling system*, which transfers materials between machines, workstations and support services. Materials handling can be carried out efficiently when the raw materials that are to be moved are grouped to form a single unit called a *unit-load*, which enables the handling equipment to easily carry and transfer the material to the desired workstations.

### Functions of Material Handling

Various functions of material handling system are listed as follows,

#### 1. Unit-Load Handling

Material handling systems can achieve optimum transport of material to their destination by following the principles of unit load, containerisation and palletisation. Design of the containers, packages and drums used for transporting the material should avoid material damage and reduce handling expenses.

#### 2. Proper Placement of Equipment

In an industry sequencing of production operations, proper placement of equipment and an apt plant layout is essential to minimize the distance travelled by the material, production time, wastage and delay in production. If it is really necessary to move the materials, then movement over short distance is preferred.

#### 3. Proper Selection of Material Handling Devices

Manual handling systems should be replaced with mechanical systems in order to enhance and speed up the movement of the material, without disturbing the production line. An efficient method of moving the materials from top to bottom is by applying the principle of gravity wherever possible. Periodic checks, repairs and maintenance of the equipment is essential. Installation of standard handling equipments which are safe, flexible and of appropriate size should be used.

### Importance of Materials Handling

The importance of materials handling can be studied under four different aspects. They are,

#### (a) Movement

It is associated with the transfer of goods into and out of storage facilities or within these facilities. Efficiency of materials handling can be achieved by efficient transfer of goods to, from and within the storage facility.

#### (b) Time

Aspect of time can be studied from production and customer's perspective. In case of production, it refers to the time required for bringing the raw materials to the production site. Efficiency is said to have been achieved if it takes less time for the transfer of goods. Otherwise, it has to encounter problems of work stoppage, higher inventories and increased space of storage.

Similarly from the customer's point of view, it refers to the time required by the firm for the fulfillment of their orders. Even, reduced shipment times/cycle times is said to be efficient.

#### (c) Quantity

Quantity refers to the amount of raw materials, finished goods transferred from/to an organization. Its accurate estimation results in delivering right product to the right customer at the right time in right quantity.

#### (d) Space

Space refers to the warehouse plant capacity used by the materials handling equipment. Such space will be fixed. However, efficiency of operations can be achieved by effectively utilizing this space.

The logistics manager is held responsible for all these materials handling tasks which involves coordination between the different individuals of an organization. Hence, while designing a materials handling system, every firm must consider both its long-term plans and its available resources.

### 3.6.1 Role of Handling Systems

#### Q16 Explain the role of handling systems in SCM

(Model Paper-III, Q8(b) | May-June-16, Q4(b))

OR

Explain the role of handling systems in effective warehouse management.

Answer : (May-16, Q4(b) | May-June-12, Q4(b))

Materials handling refers to all those activities that are responsible for the movement of goods either within or out of a warehouse. It is associated with three activities namely,

1. Loading and unloading
2. Movement to and from storage, and
3. Order filling.

#### 1. Loading and Unloading

Loading and unloading constitutes the first and last elements of materials handling process.

When goods are transferred to the transportation equipment, then it is referred to as "loading". This is almost similar to unloading, but involves the performance of additional activities such as checking the order content, order sequence and careful packaging.

Goods are unloaded/off loaded from the transportation equipment as soon as they reach warehouse. This process is termed as unloading. Sometimes the functioning of unloading and movement of goods to a warehouse are considered as a single process whereas, in some other situation they are treated as separate entities. However, it is advisable to consider them as a separate entity because when goods are unloaded they are initially sorted, inspected and classified before they have been transferred to the warehouses.

**2. Movement To and From Storage**

Goods can be transferred several times from the loading area to an unloading area. Initially movement occurs from an unloading site to a warehouse then it moves from either a shipping dock or from the order picking area for its replenishment. Various models are available for the movement of goods ranging from manual push trucks and carts to fully automated and computerised assembling and retrieval systems.

**3. Order Filling**

Depending on the sales order stocks, are selected from the warehouse. This process is termed as order filling process. Selection of order can be undertaken either from order picking areas or directly from semi permanent storage areas. Among all elements, order filling is found to be a complex materials handling activity as it is labour intensive and deals with low quantity but expensive orders.

**Q17. Explain in detail how materials handling considerations become an integral part of storage space decisions.**

**Answer :**

Materials handling is found to be an important constituent of storage space decisions, as it mainly focuses on reducing cost by optimally utilizing the warehousing space. Efficiency of materials handling can be improved by considering four essential aspects.

**1. Load Unitization**

In load unitization, materials handling must consider a fundamental principle which states that the economy (earnings) of materials handling is directly influenced by the size of load handled. Put simply, it is directly proportional to the number of trips i.e., as the number of trips increases, more number of labour is required to unload it which in turn increases the cost of operations. Hence, an entire process can be made economical by reducing the number of trips for materials handling one of the best method is by consolidating the small packages to form a single load which is termed as load unitization. Palletization and containerization are used for the accomplishment of a unit load.

**2. Palletization**

A pallet or a skid is a wooden platform usually used for stacking goods during transportation and storage. It is highly economical to keep the manufactured goods in the form of stocks until the order fulfilment requires bulk breaking. Palletization is also useful in optimal utilization of space optimal utilization space and load unitization.

**3. Containerization**

Basically, containers are used for consistent handling of materials and load unitization. Containers are secured and waterproofed large boxes, in which goods are safely placed for transportation and storage. This ability of containers facilitates the firms to store goods even in open yard without making use of ordinary warehouse.

As every firm requires containers their standardized size needs to be proposed so that it can be used by all the firms.

**4. Space Layout**

As, the cost of warehouse is mainly influenced by the location of stocks in warehouses, firms need to maintain a proper balance between the two, while designing the internal arrangement of warehouses.

**5. Layout for Storage**

While designing a warehouse 'Configuration' plays a vital role. If goods are available in large amount for storage extensive care needs to be taken for their arrangement which is a time consuming step. In a warehouse where turnover is low, wide and deep storage bays are suitable where stocking may be as high as ceiling height with narrow aisles. However, this layout may not be suitable in case of increased turnover which requires wide aisles and decreased altitude of stocks.

**6. Layout for Order Picking**

Order picking means retrieving the stock from the warehouse as per the needs of customers. Order picking is more difficult and consumes much more time than in receiving and storing of the stock. If the turnover is low, then it can simply follow an existing storage areas. But, on the other hand, if the turnover is more firm has adopted a modified systematic procedure for breaking the bulk quantity. Basic problem faced by the firms during order picking is that it consumes a lot of time to fill the order which can be reduced to a great extent by either specialized order picking equipment by operational design.

**Q18. List the principles of materials handling. Describe various factors influencing the process of selection.**

**Answer :**

**Principles of Materials Handling**

The following are the important guidelines/principles for effective materials handling.

1. Planning principle
2. Systems principle
3. Materials flow principle
4. Simplification principle
5. Principle of gravity
6. Principle of space utilization
7. Unit size principle
8. Principle of mechanization
9. Automation principle
10. Principle of equipment selection

- 11 Standardization principle
- 12 Adaptability principle
- 13 Principle of deadweight
- 14 Utilization principle
- 15 Maintenance principle
- 16 Principle of obsolescence
- 17 Control principle
- 18 Principle of capacity
- 19 Performance principle and
- 20 Principle of safety

#### Factors Influencing Process Selection

Some of the factors influencing selection process are:

##### 1 Characteristic Features of Products

Features of products hold a major impact on the selection decisions. Features like, size, weight, packaging, value, perishability, form etc., needs to be considered while selecting materials-handling system.

For example, bulk of light weighted products like oil and medicines, can be handled by tanks or pipes, whereas forklifts and pallets can be used to transfer heavy products. On the other hand, flexible materials handling equipment systems are used to handle mixture of products that are of variable sizes weights and forms.

##### 2 Government Regulations/Political Factors

From 1970 onwards, the government has been found to be taking part in the movement of dreadful materials, such as radioactive elements and other chemicals, whose inappropriate handling may be hazardous for the survival of people. Government has recommended the use of slurry systems over dry bulk systems for the movement of bulk products.

##### 3 Physical Features of Warehouse Facility

Features of warehouse facility influences the materials handling decisions. Warehouses may have large, well lit, one story facility, where conveyors, forklift trucks, shelves are the favorable equipments to be used for handling of materials. Whereas, in some other firms mobile storage is found to be favourable.

##### 4 Time

As, customers are preferring quality service at considerably low time. Hence, firms must select those materials-handling equipment that can move goods into, around and out of the warehouse as fast as possible.

##### 5 Easy to Maintain

The materials handling systems which are easy to maintain is also preferred by the logistics manager. Such type of system provides safe environment to the workers which in turn improves the productivity of a company.

##### 6 Unit Load Shipment Concept

The logistics manager can also select materials handling equipment system which makes use of unit load shipment concept. In this concept, the materials are transferred from one place to other place in batches, which carries a specific number of items in each trip.

##### 7 Optimum Utilization of Space and Equipment

A materials-handling equipment system which makes optimum utilization of space and equipment is also preferred by logistics manager. Such type of handling systems utilizes the handling equipment to the maximum extent. The equipments used for handling and storage are standardized in this systems.

##### 8 Costs

The costs incurred on the materials-handling systems is also one of the important factors which has to be considered by the logistics manager before selecting a materials-handling equipment system. The system which is associated with less cost and high returns is mostly selected by a logistics manager.

Thus, based on the factors mentioned before the logistics manager selects the materials handling system after gaining complete knowledge about different equipments and materials-handling systems.

**SHORT QUESTIONS AND ANSWERS****Q1. Transportation Cost****Answer :**

Transportation cost considers both the direct and the indirect costs associated with intransit inventory. Transportation cost is the cost incurred by the firm due to the transfer of finished goods from to the customers and also may be due to the transfer of goods from suppliers to the production plant. It is usually affected by the distance travelled by the transportation made to the delivered location where goods have to be transported by the firm.

**Q2. Modes of Transport****Answer :***(Model Paper-I, Q3 | May/June-12, Q1(c))*

Basically logistics manager makes use of five different modes of transportation, based on the geographical location and the nature of products that has to be transported. Each mode has its own features i.e., cost and time requirements which differs from one mode to another. Following are the five basic modes of transportation,

1. Railways
2. Roadways
3. Airways
4. Waterways
5. Pipelines.

**Q3. Multimodal Transport****Answer :***(June-17, Q1(e) | May/June-13, Q1(e))*

Multimodal transportation is a type of transportation system which uses more than one mode of transportation for shipment of materials/equipments from source to destination. It involves the use of more than one means of transport such as a combination of rail, truck, aeroplane, ship etc. With an increase in the transportation flexibility and increase in international shipping, there has been an increase in the use of multimodal transport system. The multimodal transportation allows the free movement of materials or equipments between different modes. While selecting the transportation mode, the organization should consider the following factors,

- (i) Nature and value of materials
- (ii) Time and distance for transportation
- (iii) Costs of transportation
- (iv) Stability of a carrier
- (v) Material security, loss and damage
- (vi) Availability of special facilities
- (vii) Delivery schedule.

**Q4. What is Warehousing?****Answer :***Model Paper-II, Q2*

A warehouse is a point in the logistics system where a firm stores or holds raw materials, semi-finished goods, or finished goods for varying periods of time. In the macroeconomic sense, warehousing performs a vital function. It creates time utility for raw materials, industrial goods and finished products. The proximity of market-oriented warehousing to the customer allows a firm to serve the customer with shorter-lead times. This warehousing function continues to be increasingly important as companies and industries use customer services as a dynamic, value-adding competitive tool.

**Q5. Equipment Warehousing****Answer :***May/June-13, Q1(h)*

Generally, warehouses are made for storing goods of manufacturers, importers, exporters, wholesalers and customers. They are usually located in cities, towns and villages. These warehouses require large and advanced equipment for loading and unloading of goods. The equipments which can be used in warehousing are often costlier and antiquated and always need attention for repairs and maintenance. A warehouse manager must select appropriate technology or equipment for effectively managing the process of warehousing. As a result of technological advancements in warehousing sector equipments are becoming obsolete within a very short span of time. The process of warehousing would be highly capital intensive if advanced equipments are utilized in the warehousing of goods and material etc.

**Q6. Handling Systems****Answer :***May/June-13, Q1(f)*

Materials handling is a process wherein the goods are transferred to, within or from warehouses to suppliers, producers or customers through appropriate channels of distribution.

Material handling involves all those activities that are responsible for the efficient movement of goods, either within a plant or a warehouse or between a plant and a transportation agency.

Material handling is defined as the manual or mechanical movements of the material between various work stations in a plant, either individually or in batches with the help of various Material Handling Devices (MHDs).

Movement of materials in an industry can be vertical, horizontal or both. Such movement initiates from the procurement of raw materials to the ultimate delivery of final products. For example, raw materials are manually loaded into a hopper which is then transferred into a mixer by pneumatic means. Granules from the mixer are initially transferred into a mill by pneumatic means and then into a blender.

**Q7. Types of Warehouses****Answer :***(Model Paper-III, Q1 June-17, Q1(f))*

The following are the different types of warehouses.

**1. Commodity Warehouses**

Such warehouses are used to handle and store perishable commodities such as lumber, cotton, tobacco, grain and other similar products that can be spoiled easily.

**2. Bulk Storage Warehouses**

These warehouses are concerned with the storing and handling of bulky products such as highway salts, liquid chemicals, syrups and oils.

**3. Household Goods Warehouses**

Storage and handling of household goods and furniture are the main activities of such type of warehouses.

**4. General Merchandise Warehouses**

These are the common warehouses which deal with the buying and selling of goods which do not require any specific handling mechanism.

**5. Mini Warehouses**

Size of these warehouses is limited usually designed as extra space and renders only few services. Even though is a convenient location it lacks security.

**Q8. Third Party Warehousing****Answer :***May/June-16, Q1(f)*

The companies which are not able to build warehouses to store the inventory on their own are moving towards the third party warehousing. In this third party warehousing, a third party provides warehousing services to the firms. All these changes in warehousing are in accordance with the increase trade, competition and technological advancement.

Third party services are offered by state warehousing corporations and other public sector undertakings such as Central Warehousing Corporations (CWC), public state warehousing corporations and others. Out of all these corporations the most dominant service provider of warehousing is CWC which carry out its operations by 444 warehouses and has a storage capacity of 73 million tones. It performs different types of warehouse activities for storage of specific items including,

- (i) Food grain warehouses
- ii) Customer bounded warehouses
- iii) Inland clearance depots
- iv) Container freight stations, and
- v) Air cargo complexes

Third-party warehousing is categorized into three types i.e.,

- I. Private warehousing
- II. Public warehousing and
- III. Contract warehousing

**INTERNAL ASSESSMENT****I. Multiple Choice**

1. Which of the following are the factors influencing transportation decisions? [    ]
  - (a) Operational factors
  - (b) Choice of transportation
  - (c) Channel strategy
  - (d) All the above
2. A warehouse that focuses on timely movement of goods. [    ]
  - (a) Is a distribution centre
  - (b) A freight forwarder
  - (c) A storage centre
  - (d) An inventory centre
3. In SCM, logistics cost constitutes, [    ]
  - (a) Transportation
  - (b) Materials handling and warehousing
  - (c) Order processing and inventory
  - (d) All the above
4. Intermodal transportation helps in, [    ]
  - (a) Attracting low cost freights
  - (b) Transferring goods through water ways
  - (c) Transferring goods through air lines
  - (d) Combining two or more transportation modes
5. \_\_\_\_\_ are primary long-distance, large volume movers. [    ]
  - (a) Railways
  - (b) Roadways
  - (c) Airways
  - (d) Waterways
6. Which of the following, is the function of inventory holding? [    ]
  - (a) Mixing
  - (b) Loading and unloading
  - (c) Movement to and from storage
  - (d) Order filling

7. A process of selecting stocks depending on the sales order from the warehouse is, [ ]
- (a) Demand fulfillment
  - (b) Order filling
  - (c) Material handling
  - (d) Break bulk
8. A document that discloses all the terms and conditions while transferring goods is, [ ]
- (a) Letter of credit
  - (b) Bill of lading
  - (c) Purchase invoice
  - (d) Sales invoice
9. \_\_\_\_\_ is a point in the logistics system where a firm stores or holds raw materials, semi-finished goods or finished goods for varying periods of time. [ ]
- (a) Cross docking
  - (b) Transportation
  - (c) Warehouse
  - (d) Material handling
10. WMS stands for \_\_\_\_\_ [ ]
- (a) Warehouse material system
  - (b) Water management system
  - (c) Warehouse management system
  - (d) Warehouse management storage

**II. Fill in the Blanks**

1. Oil and natural gas can be usually transported through \_\_\_\_\_.
2. Materials handling involves the movement of goods from to or out of the \_\_\_\_\_.
3. \_\_\_\_\_ are special type of inventory having special demand and supply patterns.
4. \_\_\_\_\_ is defined as "efficient short-distance movement of goods that usually takes place within the boundaries of a building such as plant or a warehouse, etc."
5. When goods are transferred to the transportation vehicle then it is called \_\_\_\_\_.
6. \_\_\_\_\_ is a medium through which a shipper can transport the goods to the consignee.
7. \_\_\_\_\_ helps the firms to obtain benefits by combining different modes of transport.
8. \_\_\_\_\_ plays an important role in maximizing the profitability of the local firm by efficiently transferring the goods between the partners of supply chain.
9. Public warehousing is similar to \_\_\_\_\_ and deals with receiving, storage, shipping etc.
10. \_\_\_\_\_ is a software application that is used to control the day-to-day warehousing activities.

**KEY****I. Multiple Choice**

1. (d)
2. (a)
3. (d)
4. (d)
5. (a)
6. (a)
7. (b)
8. (b)
9. (c)
10. (c)

**II. Fill in the Blanks**

1. Pipelines
2. Warehouses, storage
3. Spare parts
4. Material handling
5. Loading
6. Carrier
7. Multimodal transportation
8. Transportation
9. Private warehousing
10. Warehouse Management System (WMS)

**III. Very Short Questions and Answers**

**Q1. Write a note on Transportation.**

**Answer :**

The transportation system is a physical linkage process which is responsible for connecting focal firm with that of suppliers, customers, warehouses and channel members.

**Q2. Write about Private Fleet Format.**

**Answer :**

A private fleet is a transportation format in which firms/shipper possess their own transportation carriers. The carriers must be controlled and managed by the firms or shipper.

**Q3. What are the different Modes of Transport?**

**Answer :**

Basically logistics manager makes use of five different modes of transportation based on the geographical location and the nature of product. They are railways, roadways, airways, waterways and pipelines.

**Q4. What is Consistency?**

**Answer :**

Consistency means maintaining a pace in the transportation speed of the goods. It is considered as the most significant aspect of transportation which highlight the quality of the system.

**Q5. Write briefly about Multimodal Transportation.**

**Answer :**

Multimodal transportation is a type of transportation system which uses more than one mode of transportation for shipment of materials/equipments from source to destination.

**Q6. What is Warehousing?**

**Answer :**

A warehouse is a point in the logistics system where a firm stores or holds raw materials, semi-finished goods or finished goods for varying periods of time. It creates time utility for raw materials, industrial goods and finished goods.

**Q7. Write a note on Field Warehousing.**

**Answer :**

Field warehousing acts as one of the financing method through which working capital can be increased by a third party or a public warehouse men wherein a third party leases portion of the private warehouse.

**Q8. What do you understand by the term Warehouse Management System?**

**Answer :**

A Warehouse Management System (WMS) is a software application used to control day-to-day activities of a warehouse. It is evolved in the same manner as that of the order software solutions.

**Q9. Write about Third Party Warehousing.**

**Answer :**

Third party warehousing provide warehousing services to the firms. The companies which are not able to build warehouses on their own will opt third party warehousing services

**Q10 Define Material Handling**

**Answer :**

Material handling is defined as the manual or mechanical movement of materials between various work stations in a plant, either individually or in batches with the help of various Material Handling Devices (MHDs)

## UNIT

# 4

## Information Technology in SCM

### LEARNING OBJECTIVES

After studying this unit, one would be able to understand.

- ❖ Role of Information and Communication Technology in SCM
- ❖ Role of Information and Communication Technology at Different Levels such as Data Warehousing, Data Mining, DSS, Expert Systems, Knowledge Management etc
- ❖ Role of Information Technology in SCM
- ❖ Current IT Trends in SCM
- ❖ Concept of RFID and Bar Coding
- ❖ Concept and Elements of Retail Supply Chain Management
- ❖ Concept and Role of Packaging in SCM

### INTRODUCTION

Information and Communication Technology (ICT) plays a vital role in ensuring the upstream and downstream flow of information in real time on 24/7 basis in SCM. ICT is a combination of two technologies i.e. Information technology and Communication technology. Both technologies has gained a dramatic technological progress in the last decades. RFID stands for Radio Frequency Identification. RFID is an identification technique used for describing several technologies which makes use radio waves to identify people, place or objects through radio signals.

A bar code is an arrangement of black and white bars of different width, whose sequence depicts either letters or numbers. This sequence is a code, which is being translated by the scanners into useful information such as the type of product, manufacturing place, price of the product, the starting point of shipment, etc. Bar coding is a simple, useful, quicker and a correct technique which can store greater volume of information.

Supply chain management comprises of various processes and activities required for the conversion and processing of raw materials or component parts to produce finished goods that can be transferred to the end users by using an appropriate channel of distribution. Hence, supply chain is an association of several processes as product development, sourcing, manufacturing, distribution, transportation, warehousing etc. The limits of supply chain depends upon the scope of its operations which may range from direct supplier to direct customers or from its supplier's supplier to customer's customer.

Packaging plays an important role in every business. It is one of the major factor which influence profits of the business. It aims to promote the economical, environmental and technological significance.

### 4.1 INFORMATION AND COMMUNICATION TECHNOLOGY IN SCM

**Q1. Discuss the role of ICT in development of SCM in India.**

**Answer :**

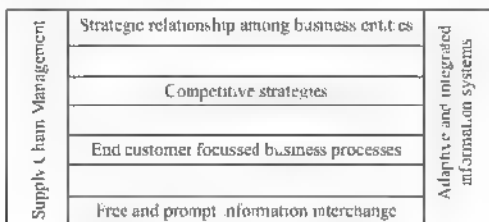
(Model Paper-I, Q9(a), June-17, Q4(b))

Information and Communication Technology (ICT) plays a vital role in ensuring the upstream and downstream flow of information in real time on 24/7 basis in SCM. ICT is a combination of two technologies i.e., Information technology and Communication technology. Both technologies has gained a dramatic technological progress in the last decades.

ICT based solutions are being offered in different entities in a supply chain. The availability of such ICT based solutions is another root cause of a myth in SCM that is proved to be a universal solution for all problems. The implementation of ICT (end to end) technology based solutions in SCM is beneficial for the business entities which makes the entities to invest in a supply chain management.

Most of the benefits of implementing SCM arises from their effective implementation and business strategies. The role of ICT based solutions is that of a key enabler. They are not total solutions, they just improve efficiencies of flow of money, material and information in SCM. Having a world class software solution is not enough for the business, in order to get the desired results the effort is to be supported by business approaches and practices.

In the current business scenario, a considerable human intervention is required for interchanging information among two business entities engaged in supply chain due to the differences in their information systems. With the 'end-to-end' supply chain, it is easy to track inventories across the supply chain and to initiate actions in advance. The information regarding production schedules of producing partners, demanded inventories, expected shipment dates and arrival dates of consignments in transit etc can be easily available and shared with the supply chain partners freely. The figure below shows the role of ICT in supply chain management.



**Figure: Role of ICT in SCM**

**Q2. Discuss the role of ICT in SCM at different levels.**

**Answer :**

The role of ICT in SCM at different levels are categorised into the following levels.

1. Business transaction processing
2. Business intelligence
3. Decision support systems
4. Expert systems
5. Knowledge management
6. Data warehousing
7. Data mining

#### 1. Business Transaction Processing

It involves processing of various business transactions such as Material Requirement Planning (MRP), customer order processing, goods inwards, inward and outward inspection, dispatch and invoicing, maintaining books of accounts according to statutory requirements, stock accounting, manufacturing routing, purchase ordering etc.

There are number of independent business entities in SCM which has its own information system for business operations like modular architecture integrated systems or stand alone systems. Some of the examples of stand alone systems which help in business transaction processing are sales force automation system, customer order processing system, inventory management system, HRM system, PPC system, financial accounting system, portfolio management system etc.

Most of the ERP solutions use such modular architecture and common data base in their enterprise. ERP solutions provide a robust Information and Communication Technology (ICT) based business transaction processing system benefit and a number of ready made solutions. The logical extensions of ERP concept are data mining and data warehousing.

## 2. Business Intelligence

Business intelligence tools and techniques use data warehousing and offer benefits like quick replies to simple queries generating analytics reports for highlighting trends and use various forecasting methods for future trends. Data warehousing provide hard data support to business intelligence activities. In the growing stage, BI was considered as a field for a selected group of executives but not it is allowed to large number of executives in the organization.

Business intelligence tools and techniques enables the marketing team to understand the trends in consumer behaviour, buying patterns of consumers and monitor market segmentation in a more suitable manner. BI also enables SCM in creating perpetual bottlenecks and early warnings of likely stock outs.

## 3. Decision Support Systems

As the name indicate it aims at providing support for decision making activities. According to O'Leary and Williams "DSS is a set of computer programs and hardware that help managers arrange information from various sources in new and different ways."

DSS tools, DSS generators and specific DSS are the three components of Decision Support System (DSS). In real life, DSS implementation include three modules as shown in the figure below.

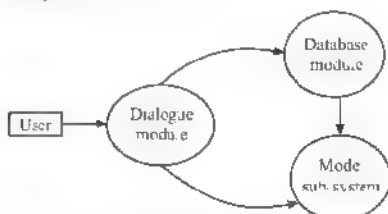


Figure: Decision Support System

### (i) Dialogue Module

It is a user interface module where user of the system interact with all modules of DSS.

### (ii) Database Module

It deals with data base management activities, a typical database management system is used to operate this module.

### (iii) Model Sub-System

It deals with algorithms, norms, mathematical models, logic and rules used in DSS system.

ICT based solutions enables decision support system in SCM. One of the example of ICT in decision support system is demand forecasting.

## 4. Expert Systems

Expert System, is the information system that provides solutions to various problems by capturing knowledge for a specific and limited domain of human expertise. It provides assistance for decision making by asking questions. It adopts certain actions based on the answers.

It also explains the reasons for the actions it does. Expert systems do have a set of rules, formed by capturing the knowledge of the skilled employees in an organization. The rules are accumulated in the memory of the organization.

Expert systems are developed by means of 'knowledge engineering'. Knowledge engineering is the process of creating a knowledge base and it is done by a knowledge engineer. He works with various experts experiences and develops the rules based on it. Thus, he builds the knowledge base level by level.

The development of expert systems involves acquiring knowledge from various experts. Many other factors are involved in the development of expert systems knowledge is not exact. One must also consider the well-known fact that knowledge is never complete. It is acquired gradually, level by level. Increase in number of mistakes and recovering from them always increases knowledge. Knowledge is mostly acquired using the trial and error method.

For instance, consider a person who is a fresher at college. Firstly, he learns the basics of the subject and then gradually develops strong conceptual knowledge. Finally, he will be able to achieve expertise by practice and experience. Similarly, expert systems are developed in an incremental way. Initially, only a few basic set of rules are defined. They are applied to some set of data and are verified. Repeating this process, by changing input data and the set of rules, the expert system increases its experience and updates its knowledge base with new rules time to time. Finally the expert system acquires high level expertise with great deal of knowledge.

#### 4.4

##### 5. Knowledge Management

For answer refer Unit IV, Page No. 4.4, Q.No. 3.  
Topic: Knowledge Management

##### 6. Data Warehousing

For answer refer Unit-IV, Page No. 4.4, Q.No. 3  
Topic: Data Warehousing

##### 7. Data Mining

For answer refer Unit IV Page No. 4.5 Q.No. 3  
Topic: Data Mining

#### Q3. Explain knowledge management, data warehousing and data mining

**Answer :**

##### Knowledge Management

Knowledge is considered as a very important resource which needs to be effectively managed in order to get the most out of it. Knowledge management refers to the process of optimum utilization of knowledge resources in an organisation in order to get the maximum benefit out of it.

Knowledge management is any process or practice of creating, acquiring, capturing, sharing and using knowledge, wherever it resides, to enhance learning and performance in organizations.

*Scarborough Swan and Preston, 1994*

In an business enterprise, knowledge is divided into two types. They are,

##### 1. Tacit Knowledge

Tacit knowledge is a practical and operational type of knowledge. It is the knowledge which an individual uses in everyday life like riding a bicycle, playing a sport etc. It is primarily based on the person's beliefs, feelings, emotions and intuitions. It is acquired through one's own experience and learning. It is unstructured and intangible in nature. It consists of a person's ideas and judgment and completely personal in nature. Tacit information cannot be easily documented, recorded or transferred. It can only be taught with help of the apprenticeship mode of learning. Many of our actions and behavior which are considered as the parts of our attitude turns out to be our beliefs. They are not actually beliefs but rather a part of our nature that builds up over the years even without our notice.

##### 2. Explicit Knowledge

Explicit knowledge basically refers to the knowledge which is semi-structured in nature i.e., which is present in the form of words and numbers. This knowledge can be shared, stored and transferred in different forms like email, voice mail, audio, video, data, specifications, manuals etc. It is codified and presented in a format which can be easily adopted, absorbed and used for learning by others.

#### SUPPLY CHAIN MANAGEMENT

IT plays a key enabler role to facilitate smooth and efficient operation of various components of knowledge management such as knowledge creation, capturing knowledge, secured storage of knowledge, retrieving and storing knowledge. IT provides tools and techniques to support knowledge management activities. These tools and techniques assist in simulation and modelling, indexing and storage of knowledge and information, creating knowledge repository, building rules and algorithms, retrieval, providing appropriate security and access control mechanism etc. Knowledge engineers play an important role in using IT tools and techniques for knowledge management.

##### Data Warehousing

A data warehouse is a database that collects business information from many sources in the enterprise, covering all aspects of the company's processes, products and customers. The warehouse provides business users with a multidimensional view of the data they need to analyze business conditions.

Data warehouse is a large electronic storage area that is structured so that the data stored in divergent formats is converted to constant output, such as the same type of database.

Companies are focusing on developing data warehouses to leverage existing businesses and generate new growth opportunities. Today virtually every transaction and minute business detail in the corporate environment is recorded in databases in the hope that it will enable more effective decision making throughout the organization.

Data warehousing in supply chain management include hardware and software components. Hardware component store effective refined data in a magnetic form. Software component explain the methods of populating data warehousing, structure and architecture of data warehousing tools for entering and extracting warehouse data. Various data warehouses advanced application systems such as business intelligence, enterprise performance monitoring system etc are used in SCM.

The organizations are using data warehousing for decision support to exhibit the following characteristics.

- (i) An information-based approach to decision making.
- (ii) Involvement in highly competitive, rapidly changing markets with a large, diverse customer base for a variety of products.
- (iii) Data stored in many system and represented differently.
- (iv) Data stored in complex, technical, difficult-to-decipher formats, making conversion for analysis difficult.

Most of the vendors become vendors of new technology with different product features and functionality, such products offer high integration with other products. Several vendors of ERP are offering data warehousing solutions as separate products while others are offering as a module of the total business solution.

Data warehouses are necessary as enterprise wide increase in both volume and complexity, making it important to establish an information system architecture that transforms scattered legacy data into useful information. The data warehouse performs the following functions,

- (i) Allows existing transaction and legacy systems to continue in operation
- (ii) Consolidates data from the various transaction systems into a coherent set
- (iii) Allows analysis of vital information about current operations for decision support

#### Data Mining

The term 'Data Mining' refers to the finding of relevant and useful information from database. Data Mining and knowledge discovery in the database is a new interdisciplinary field, integrating ideas from statistics, machine learning, databases and parallel computing.

Data Mining is the process of discovering meaningful, new correlation patterns and trends by sifting through large amount of data stored in repositories, using pattern recognition techniques as well as statistical and mathematical techniques.

Data Mining refers to using a variety of techniques to identify information or decision-making knowledge in the database and extracting these in a way that they can be put to use in areas such as decision support, predictions, forecasting and estimation.

Data mining is a new novel technology concept that possess immense potential to tap information resource for business entities. Most of the companies are working on data mining pilot projects at a stage of "proof of concept". The following factors are considered as best for the success of data mining projects.

1. Clear statement of addressed problems indicating the root cause of problem with the help of available tools and human intelligence.
2. The identified problems must be relevant for the business and supported by the senior management.
3. Business transaction processing layer must possess strong data which can be used to solve the problems.

## 4.2 ROLE OF IT IN SCM

**Q4. Explain the role of IT in supply chain management. What are the technologies used in SCM?**

OR

**Critically examine the role of IT in supply chain management.**

**Answer :**

*May/June-13, Q4(b)*

### Role of Information Technology in SCM

Information Technology (IT) plays an important role in managing information and flow of goods. Organizations faced challenges for smooth integration of suppliers, wholesalers and retailers and also to manage data precisely for re-amine in whole supply chain. Although, the emergence of different softwares such as EDI, GPS, RFID, ERP, WMS etc have significantly facilitated the smooth flow of supply chain management.

### Technologies Used in Supply Chain Management

Following are the technologies used in supply chain management,

#### 1. Electronic Data Interchange (EDI)

Electronic Data Interchange (EDI) is the process where computers are used to exchange business related information. EDI plays a vital role in SCM. The significance of EDI in SCM can be understood from the following points,

- (i) EDI reduces human involvement and increases paper less transactions.
- (ii) It reduces the data storage expenses as storage and manipulation of data is done electronically.
- (iii) EDI enables trading partners to complete the transactions quickly.
- (iv) Through EDI inventory can be reduced with efficient planning information.
- (v) Finally EDI when joined together with artificial intelligence, results in efficient SCM.

#### Steps in EDI Implementation

Implementation of EDI system includes the following steps,

##### (i) Building an Organizational Structure

The first step in implementing the EDI system is building an organizational structure in which the process is either controlled and managed by a team or an individual person and maintain interaction with external parties.

##### (ii) Selecting the Location of EDI

Secondly, the various business activities are reviewed strategically and the areas where implementation of EDI would be beneficial are selected.

**(iii) Identifying an EDI Solution**

The next step is identifying an EDI network and software provider. This is done either by an expert within the organization, professional or outside the organization.

**(iv) EDI and other Systems**

Integrating EDI with other back-end systems, reduces the expenses which enhances savings and improves overall business efficiency.

**(v) Evaluating the Internal Business Processes**

Proper information flow across EDI network is possible through mapping of all the business documents and systems.

**(vi) Trail and Errors**

Once the EDI system is ready to implement, a trail process must be carried out to rectify the errors if any.

**(vii) Integrating Trading Patterns**

Once the mistakes in implementing the EDI system are rectified, final step is integration of EDI system with trading partners.

**2. Radio-Frequency Identification (RFID)**

RFID stands for Radio Frequency Identification. RFID is an identification device used for describing several technologies which makes use of radio waves to identify people, place or objects through radio signals.

RFID technology has been practised since many years, but it could not gain popularity due to its expensive installation and implementation. RFID technology is developing day-by-day and the researchers are trying to minimise the cost so that RFID can be used widely.

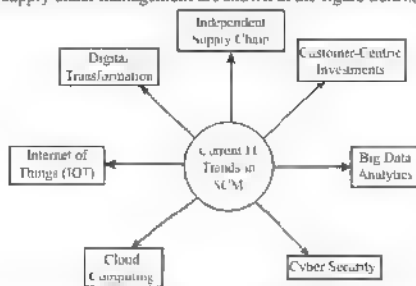
**3. Bar Coding**

A bar code is an arrangement of black and white bars of different width, whose sequence depicts either letters or numbers. This sequence is a code, which is being translated by the scanners into useful information such as the type of product, manufacturing place, price of the product, the starting point of shipment etc. Bar coding is a simple, useful, quicker and a correct technique which can store greater volume of information.

**4.2.1 Current IT Trends in SCM****Q5. What are the current IT trends in SCM?**

**Answer :**

The current IT trends in supply chain management are shown in the figure below.



**Figure: Current IT Trends in SCM**

**1 Customer-Centric Investments**

At present there is an increased focus on customer-centric technologies and strategies. Better communication with customers and more productivity is the main motto of all the organizations. In supply chain industry, manufacturers focus on customer demand for customer-centricity that affects the individual product launch. It also creates an entire supply chain process which is customer-focused. The manufacturers are pushing towards getting better in analyzing data sources, sensing demand, predicting market drivers and responding quickly and precisely in order to meet customer expectations.

**2. Big Data Analysis**

Big data is providing a greater data accuracy, clarity, decisive insight and signaling a rise in more contextual intelligence to supplier networks in the current era. These are shared throughout the supply chains. Modern analytics are mixed with more number of optimization tools involving demand forecasting, integrated business planning and super collaboration along with risk analytics. Further more, the big data analytics helps the supply chain to meet the accelerating demands for shipment and transactions as most of the organizations are forced to function as digital enterprises.

**3. Cyber Security**

According to the study conducted by Deloitte and manufacturers alliance for productivity and innovation (MAPI) about 40% manufacturing companies were getting affected by cyber threats since last 12 months. These cyber threats with almost all cyber breaches have resulted in over \$1 million damages. In order to protect the technologies from the threats, supply chain executives are focusing on data protection technologies and strategies.

**4. Cloud Computing**

Cloud computing applications provides a transformational effect on the business and the supply chain operating model through optimizing opportunities for flexible participation and enriched data analytics. The cloud-based supply network allows innovations in supply chain management. It empowers information to be more readily available and bring huge value to operational processes with respect to end-to-end visibility.

**5. Internet of Things (IoT)**

According to Gartner's internet of things in supply chain illustrates, how smart devices are changing the experience of customer and meanwhile now badly Internet of Things (IoT) innovations are tracking the supply chain. By 2020, it is estimated that internet of things will connect 25 billion devices creating both enthusiasm and doubt about the value to the supply chain. By implementing IOT supply chain, strategists can differentiate the future IOT with the current IOT. This innovation has already being initiated by Amazon with IOT order buttons that makes customers to place orders on a one click.

**6. Digital Transformation**

In the present market situations, digitalization is made mandatory for a success of the firm. A recent report stated that manufacturers who has not adopted digitalization have to confront struggles in order to succeed in future. The report states that, by 2018, only 30% of manufacturers will be able to maximize their profits through investing in digital transformation. By 2019, 75% of large manufacturers will update their operating models with Internet of Things (IoT). In addition to this, by 2018, 60% of manufacturers will acquire new revenue from information-based products and services. Meanwhile, the embedded intelligence will move to the profitability levels.

**7. Independent Supply Chain**

At present, supply chain industry is looking forward to develop an independent supply chain in the coming future. The independent supply chain will be exerted by technologies which are now in the initial stages of quality assessment. Some of the examples of these technology are, Uber's self-driving truck, Amazon's drone delivery within 30 minutes and various robotic tasks that are replacing the present ordinary tasks at assembly lines, warehousing and industrial farming environments.

**4.3 RFID – BAR CODING****Q6. Discuss in detail about RFID.**

**Answer :**

**RFID**

RFID stands for Radio Frequency Identification. RFID is an identification device used for describing several technologies which makes use radio waves to identify people, place or objects through radio signals.

RFID technology has been practised since many years but it could not gain popularity due to its expensive installation and implementation. RFID technology is developing day-by-day and the researchers are trying to minimise the cost so that RFID can be used widely.

RFID contains a microchip inserted in a product or item in which data related to product or item is stored.

The RFID tags are two types,

1. Active tag
2. Passive tag

Active tags are expensive because it has in-built battery where as passive tags are inexpensive and does not have internal battery. Both active and passive tags have the capacity to read-only or read/write. These tags can be used either one time used or reusable. These tags are used to read Electronic Product Code (EPC) which is a code number used to recognize a particular item in the supply chain and also maintain record information in order to direct the work flow.

RFID tags minimise labour cost of the company on account of its good tracking system and thus system is efficient.

The various application of RFID technology are.

1. Inventory management plays an important role in retail business and this task can be performed effectively by RFID system. RFID provides alarm facility to the store keeper which helps them in maintaining appropriate stock and this results in higher customer satisfaction and huge business profits.

#### 4.8

2. RFID system can be used in blood banks to avoid general human mistakes. Usually, in blood banks most of the blood bottles consist of similar labels which may cause confusion to the hospital management. In order to avoid this risk RFID tags can be attached to the blood packets which helps the medical staff in identifying correct blood group.
3. RFID tags are used in stores/malls to avoid theft of some expensive items. RFID tags can be attached to the items or can be kept near the exit door. RFID system provides alarm facility through which one can identify the items missing in the store and can also avoid theft.
4. RFID technology can be used in hospitals to locate patient, doctors, nurses or other staff.
5. Apart from the above RFID applications, it is also used in animals. A small microchip is inserted into the animal's skin which gives information related to animal and also its owner.

#### Advantages

1. RFID is a flexible identification device and can be moved easily.
2. RFID tags can be read only or read/write. The technology of RFID is versatile in nature.
3. Implementation of RFID technology results in accuracy and speed of data collection.
4. RFID tags are robust and can be used in any environments and temperatures.
5. RFID enables transmission and reception of radio signals. Since it uses radio frequency tags and reader.
6. RFID tags can be used in stores to prevent theft, thereby providing the facility of protecting expensive items in the store.
7. RFID tags have greater storage capacity.
8. RFID enables good tracking system.

#### Disadvantages

1. RFID technology is highly expensive.
2. If RFID tags are in liquids and metal products then, it is highly difficult to read.
3. Range of frequency differs from one country to another and it is difficult to know the working pattern of other countries where RFID tags perform their activities. It takes a lot of time.
4. At times RFID radio waves are disturbed.
5. RFID technology is considered as invasive technology.

#### SUPPLY CHAIN MANAGEMENT

**Q7 Explain briefly about bar coding with its advantages and disadvantages. Show the differences between bar coding and RFID**

**Answer :**

*Model Paper-II, Q9(a)*

#### Bar Coding

A bar code is an arrangement of black and white bars of different width, whose sequence depicts either letters or numbers. This sequence is a code, which is being translated by the scanners into useful information such as the type of product, manufacturing place, price of the product, the starting point of shipment, etc. Bar coding is a simple, useful, quicker and a correct technique which can store greater volume of information.

The bar code standards followed in one industry differs from the other industries. Bar code standards explain the language used in coding, the type of information the label holds, format of information, etc. Bar code standards can be of different types like Universal Product Code and AIAG (Automotive Industry Action Group) standards. If common bar code language is used by both suppliers and manufacturers, then it becomes easy to read the product labels.

The scanners used in bar coding system are of two types. They are:

- (a) Handheld scanners.
- (b) Automatic scanners.

#### (a) Handheld Scanners

Handheld scanners are flexible and can be moved from one place to another place.

#### (b) Automatic Scanners

Automatic scanners are not flexible. They are fixed in one place and scans the product packages one by one moving on the conveyor belt.

Through scanners, the black and white bars on the product package are transformed into electronic signals and records the code in the form of 0's and 1's, i.e., binary digits. Bar coding system is very common in retail outlets.

#### Example

Supermarkets with the use of bar coding system. Supermarkets had stopped labeling their products with price tag and started using various scanning devices to scan their product bar code.

Bar coding has helped in reduction of inventory in warehouses by being helpful in data collecting accurately, saving operation's time and maintaining database and inventory controls.

**Advantages**

1. Bar coding system is an effective system for inventory tracking activities
2. Increases the accuracy levels in data collection activities of the storekeeper
3. Bar coding system saves lot of time
4. Labour cost and other costs can be minimized through bar coding system
5. Integrated database management is possible through bar coding system
6. Bar coding technology operates very quickly. Activities like ordering or receiving of items can be performed within a limited period of time

**Disadvantages**

1. If the discount prices are not coded properly it may cause price discrepancies.
2. Bar code readers cannot read damaged, dirty or wrinkled labels
3. Bar code system is expensive
4. Training has to be provided to new employees to use bar codes which is not possible for small and medium scale enterprises
5. High-quality bar codes cannot be printed by dot matrix and ink jet printers

**Differences between RFID and Bar Coding**

Following are the differences between bar coding and RFID.

Bar Coding		RFID	
1	In case of bar coding, a code is printed on the product label	1	In RFID technology, a small microchip is inserted within the pack
2	The storage capacity, is less in bar coding.	2	Huge data can be stored in RFID tags
3	Bar coding is less secured.	3	RFID technology is more secured and protected than bar coding
4	Bar coding depends upon line-of sight scanning.	4	No such dependency is there in RFID technology
5	Less expensive.	5	Highly expensive
6	With standard bar code language suppliers and manufacturers can understand each other's package labels	6	No such standards are used

**4.4 RETAIL SCM**

**Q8. What is retail Supply Chain Management (SCM)? What are the various elements of retail SCM?**

**Answer :**

*Model Paper-I, Q9(b)*

**Retail SCM**

Supply chain management comprises of various processes and activities required for the conversion and processing of raw materials or component parts to produce finished goods that can be transferred to the end users by using an appropriate channel of distribution. Hence, supply chain is an association of several processes as product development, sourcing, manufacturing, distribution, transportation, warehousing etc. The limits of supply chain depends upon the scope of its operations which may range from direct supplier to direct customers or from its supplier's supplier to customer's customer.

Besides taking care of all the above mentioned activities retailers must also be concerned with other supply chain issues such as selecting products for stock (Assortment management), pricing of the product and also with the reverse logistics (if goods are returned from customers). Efficiency and effectiveness of such processes are mainly effected by the variety types of products offered by the retailers, its price and also by the levels of customer service, offered by focal firm. Wal-mart, one of the world's leading retailing company has continuously bought many innovations in the supply chain processes and has improved the overall supply chain CRP (Continuous Replenishment Programs), CPFR (Collaborative Planning Forecasting and Replenishment), FRM (Floor Ready Merchandise) etc., are the few programs/innovations introduced by Wal-mart.

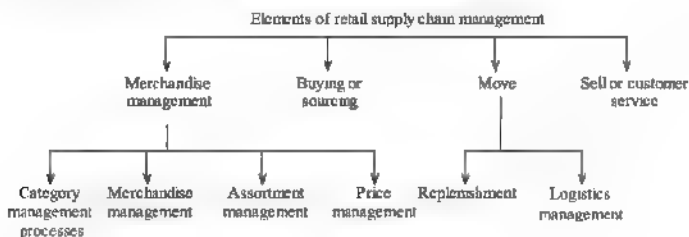
Retail supply chain is not a single entity but it is found to be cluster of supply chains. For instance, a software manufacturer will usually deal with a single software dealer/supply chain, but a retailer like Spencer has to deal with large number of supply chains for different products i.e. for consumer durables, food and grocery, dairy products, furniture, jewellery etc. Further these supply chains will have different group of suppliers, separate forecast and replenishment patterns etc.

#### Elements of Retail Supply Chain Management

Basically the elements of retail supply chain management are categorized into four types. They are

1. Merchandise management processes
  - (i) Category management processes
  - (ii) Merchandise management
  - (iii) Assortment management
  - (iv) Price management
2. Buying or sourcing processes
  - Product design source
3. Move or logistics processes
  - (i) Replenishment
  - (ii) Logistics management
4. Sell or customer service

The elements of supply chain management are illustrated in the figure



Figure

#### 1. Merchandise Management Process

Merchandise management process consists of four other management processes namely category management processes, merchandise forecasting and budgeting process, assortment process and price management process. Merchandise mainly deals with selling of goods.

##### (i) Category Management Processes

It is a process which defines merchandise categories and develops strategies for each category. It has to perform the following functions such as category planning, category role definition, developing category strategies and tactics.

##### (ii) Merchandise Forecasting and Budgeting Process

These processes are helpful in long term forecasting of merchandise requirements, financial budgeting process and budget control i.e., open to control process.

##### (iii) Price Management Process

Price management basically includes planning processes like promotion planning, planning markdowns, Trade funds planning, promotion optimization, promotion collaboration etc.

**(iv) Assortment Process**

Wide range of products offered for customers retail store is called assortment. Assortment process is helpful for store management as it depicts the physical existence of products that has to be displayed at the stores during a particular period of time

**2. Buying or Sourcing Processes**

Retailers have several sourcing options, they can either make direct purchases from the manufacturers or the wholesalers or distributors. Sourcing includes designing private labels, packaging design, outsourcing manufacturing, selecting vendors, releasing purchase orders and ultimately vendor selection

**3. Move****(i) Replenishment**

Replenishment is refilling the stock which can be done from vendor to store or from vendor to central warehouse or from central warehouse to store approaches. Several new technological approaches such as VMI (Vendor Managed Inventory), CRP (Continuous Replenishment Program), CPFR (Collaborative Planning Forecasting and Replenishment Approach), DSD (Direct Store Deliveries) also performs the function of stock replenishments

**(ii) Logistics Management**

Logistics management deals with various processes engaged in moving goods from either suppliers to firm or from firms to customer like transportation, warehouse management, inventory management, etc. Besides this, new retailing also includes logistics outsourcing, green logistics and so on

**Q9. Discuss briefly transportation cycle for a retailer and steps involved in it.**

**Answer :**

**Transportation Cycle for a Retailer**

Transportation cycle deals with a series of activities which a retailer performs for shipping a set of articles. For example, delivery of a full truck load from a retailer's retail distribution company to a store

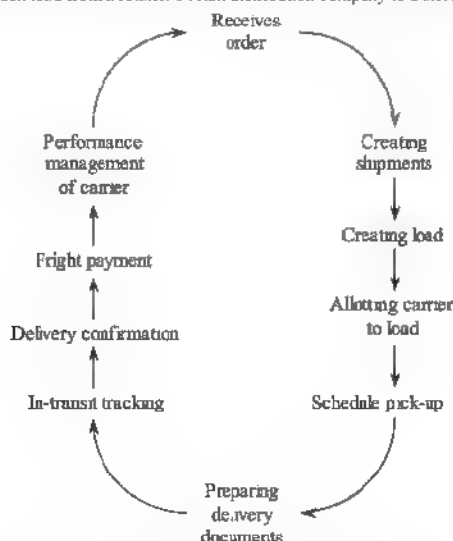


Figure: Transportation Cycle of a Retailer

**Steps**

The following are the steps involved in the transportation cycle of a retailer

**1. Receiving Order**

In the first step, order is placed at a store of a retail distribution company. In case of a continuous replenishment process, there will be no order and on the basis of the stock information at store, replenishment decisions are taken.

**2. Creating Shipments**

This is the second step of the transportation cycle of a retailer in which, on the basis of the common service requirements and freight terms, the orders are grouped. The retailers will separate the order which are very large of which needs multiple shipments or periodic delivery schedule.

**3. Creating Load**

In this step, the retailer decides about the type of transportation mode that has to be selected for shipments by considering the delivery date for stores for meeting the desired service level. It is mostly found that the retail distribution company tends to be located usually a hundred kilometers away from a retail store so the load will mostly be transferred by trucks.

**4. Allotting Carrier to Load**

This step basically involves a decision about load to a particular carrier. Depending on the cost, service, performance, availability etc., appropriate allocation must be done. The retailers who have their own fleet makes use of them for transporting loads whereas, others who don't have their own carriers will outsource their transport operations to the third party.

**5. Schedule Pickup**

In this step, the shipment is moved towards the warehouse for picking and work scheduling.

**6. Preparing Delivery Documents**

It is concerned with the preparation of the important delivery documents like pick sheets.

**7. Using In-transit Tracking**

The consignee is monitored by the retailer after it leaves the retail distribution company till it reaches the store. Manual tracking systems and sophisticated tracking systems are used by the retailers for monitoring the consignee. If any delay takes place, then the retailer had to take immediate corrective actions for avoiding out of stock situation in stores.

**8. Confirmation of Delivery**

After the arrival of shipment at the store, it should give a proof of delivery to the transporter. The proof of delivery can be given either in the form of a physical document or can be sent to the retailer electronically with the help of Electronic Data Interchange (EDI). Sometimes, the retailers give payment to the transporter on the basis of the proof of delivery.

**9. Freight Payment**

After the delivery of the shipment, the transporter is liable to give his claims which needs to be processed by the retailers. The retailer verifies the claims or documents submitted by the transporter and if any transit damage or delay occurs beyond a limit then the retailer will deduct some percentage of the transporter's payment.

**10. Performance Measurement of Carrier**

This is the last and final step of transportation cycle where the performance of the carrier is evaluated on the basis of the schedules performance, damaged record, service flexibility etc.

**Q10. Discuss in detail retailers inventory management framework.**

**Answer :**

*Model Paper-III, Q9(a)*

Like working capital inventory is also important for smooth functioning of business processes. Every firm requires some amount of inventory. For example, amount of materials required to meet its demand for consumption and also to overcome the uncertainty involved in future for its usage and availability.

In order to maintain optimum level of inventory, retailers must have proper framework for inventory management. The framework for inventory management in retail outlets is divided into 3 parts. They are business drivers which leads to efficient inventory management, inventory decisions and inventory management tools. In order to have business drivers, retailers must make effective inventory decisions which in turn require different tools.

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Inventory management business drivers	Business drivers				
	High customer service		Optimum investment in inventory		
Inventory management decisions	Inventory decisions				
	Which item to stock?	Where to stock?	How much to stock?		
Inventory tools	Inventory management tools				
	Cross docking	Collaborative tools (VMI, CPFR)	Just-in-time	Network optimization	Multi Echelon inventory planning
	Cycle counting	Good issue receipt system	Inventory valuation	Inventory modeling (P-model Q-model EOQ model)	Scientific calculation of cycle stocks, safety stock, cost of inventory etc

Figure: Retailer's Inventory Management Framework

The components of inventory management structure for retailer are explained in detail as follows,

#### Business Drivers

Customer service and customer satisfaction are considered as the two important performance indices of SCM. As performance measure acts as an improvement element, it is the responsibility of managers and supervisors to incorporate changes within the organizational climate. Performance measures quantitatively reveal the characteristic features of products, services and processes that produce them.

Performance indicators of the firm need to be realistic and quantifiable (both in financial terms as well as in physical terms). Such indicators need to perform consistently so as to maintain uniformity throughout the supply chain.

Certain circumstances provide improvement opportunities for inventory management. Some of them involve,

1. Increased complaints that have been put forward by customers and distributors leading to increased frequency of order cancellation.
2. Reducing stock turn performance even though large amount of inventory is maintained in the warehouse.
3. Due to the delivery of dissatisfied service level of backorders increases.
4. Shortages of storage space due to excessive inventory holdings.
5. Increased investment on dead slow items.
6. Due to technological updations, large number of items become obsolete. Thus, the aforementioned circumstances call for the maintenance of inventory at cost effective level by introducing several financial and operational measures.

#### Financial Performance

It can be obtained by,

1. Increasing the rate of return on inventory investment.
2. Enhances the performance by increasing the percentage of inventory versus percentage of sales.
3. Depending on the demand of certain items, they need to be discarded per period.
4. Decreasing the level of capital that has been consumed by dead slow items.

#### Operational Performance

It includes,

1. Increasing the service levels of customers over time.
2. Care must be taken while quantifying the level of inventory.
3. Customers who have not been serviced need to be identified.
4. Increasing sales percentage of stocks by improving the demand and supply relationships.
5. Identifying the number of stock outs per period.

After going through the insight of performance indicators, let us discuss about the role of inventory as an element of customer service.

In order to determine the relationship existing between the availability of stocks and service costs, firms introduce a graph, which is represented by figure. As, 'availability/service level policy' is a major consideration in managerial decision-making its formulation requires managerial attention. A proper balance can be maintained by adding "safety stock" to the existing stock levels of firms that are necessary for providing service to the customers.

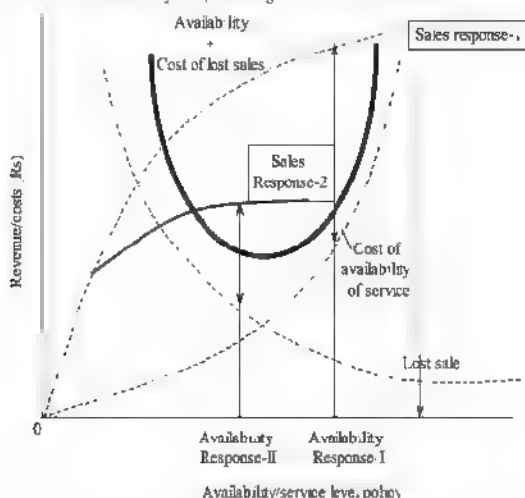


Figure: Relationship between Availability of Stock and Service Cost

Figure represents that as service/availability levels move towards 100% availability, there is an excessive increase in the inventory levels due to the availability of safety stock. According to one study, it has been realised that when availability response was increased from 95 to 97%, there was about 15% incremental increase in stockholding costs. This incremental increase was obtained when firms practiced alternative policies. Some of them are

1. Identifying the critical inventory items whose availability can act as a "Convert element" of competitive advantage. Firms need to maintain high levels of such items due to their high demands from customers.
2. Another alternative could be the usage of efficient mode of transportation as a substitute.
3. Identifying the rates of sale and demand patterns of different items so as to provide the accession of high levels of high volume, short lead time items close to the customer outlets.

#### Inventory Decisions

Inventory management is gaining considerable attention in the recent years due to the following major factors,

1. Economic recession has resulted into the scarcity of resources, which in turn brings reduced sales volume and revenue growth. This has forced management to adopt various methods to efficiently reduce the levels of inventory within the logistics systems so as to maintain the profit margins.
2. Emergence of new manufacturing philosophies such as, JIT and lean manufacturing have reduced the need for inventory within the overall logistics chain.
3. Realisation of the fact by the firm that core business can be developed only through increased ROI (Return On Investment) but not merely just from investment in working capital.
4. Due to the rapid technological development, the levels of inventory can be reduced to a great extent. The application of information systems such as POS (Point Of Sales), ERP (Enterprise Resource Planning) plays a crucial role in reducing inventory.

**Inventory Management Tools**

In order to solve inventory problems retailer choose different tools which are ranging from simple to most advanced. The inventory management tools can be explained with the help an inventory management pyramid



Figure: Tools for Inventory Management Concept of Inventory Pyramid

**Inventory Control**

The base of inventory pyramid explains about inventory control. It mainly focuses on those operations which helps in controlling inventory level such as making record of all inventory transaction which includes receipt of goods issued, cycle counting to obtain accuracy in inventory evaluation process etc. These are very important processes which provides timely and accurate information about the position of inventory. Retailers issue their goods receipt by combining them with point of sales system to have effective inventory control. This is applicable to all retailers.

**Inventory Management**

The second level of pyramid deals with the method through which inventory can be managed successfully. In order to identify the level of order quantity and time to order, retailer will use scientific approaches. These scientific approaches includes evaluation of demand variability, supply variability and customer service percentage to accomplish the quantity of safety stock. During suppliers lead time retailers can implement statistical tools to estimate the expected consumption to avoid scarcity of stocks during a particular period.

**Strategic Inventory Management**

Retailers of this level implement new tools to be in the top position, and are known as innovators. The important practices of retailers in strategic inventory management are,

1. Implementing best practices of inventory management like VMI, CPFR, Just-in-Time, etc.
2. Retailers effectively combines with suppliers so that inventory level can be reduced.
3. Make decision about the locations where inventory has to be held with the help of simulation.
4. Retailers motivate to reduce supplier's lead time so that requirement of inventory can be reduced.
5. Provisions are made to reduce uncertainty in demand and supply which reduces levels of safety stock.

**Inventory Models**

Retailers makes use of certain inventory models to make effective inventory decisions some of them are,

1. EOQ model or Q-model which determines reorder point and economic order quantity
2. P-model or periodic review method which helps in identifying inventory levels for multiple stock items
3. Min max model and
4. Two bin system

**Q11. Discuss the best practices in retail inventory management.** *Model Paper-II, Q9(b)*

OR

**What are the various practices which retailers use in inventory management?**

**Answer :**

The main aim of the retailers is to provide excellent service to the customers with a minimum investment in inventory. For this purpose the retailers make use of best practices in retail inventory management. These practices are as follows,

1. Cross docking
2. Vendor managed inventory
3. Collaborative planning, forecasting and replenishment
4. Build to order model
5. Postponement
6. Determining a fixed set of options which covers maximum customer requirements

**1. Cross Docking**

With the help of cross docking, inbound and outbound shipments can be coordinated effectively which in turn helps in reducing the amount of inventory at retail distribution centres. In cross docking, the items will be directly transported to the store which not only enables retailers to help reduce the levels of inventory but also to reduce the lead times of supply from supplier to store. Wal-Mart is the best example where the concept of "cross docking" is used effectively for reducing the levels of inventory in retail warehouses.

**2. Vendor Managed Inventory**

In vendor managed inventory, the stocks are managed by the suppliers on the basis of the stock and sales information received from the retailers on a regular basis. If the supplier has complete information about the sales trend of the product, it not only enables him in the effective management of stocks but also for its constant replenishments which in turn reduces the levels of inventory.

### 3. Collaborative Planning, Forecasting and Replenishment (CPFR)

In this practice of a retail inventory management, the retailer prepares the business plan, future forecasting and replenishment plan along with the suppliers. In order to formulate such plans the information needs to be regularly shared among the retailers and suppliers which is also a prerequisite for making better inventory replenishment decisions, through which stocks can be reduced and customer service can be enhanced to a great extent.

### 4. Build to Order Model

The build to order model is one of most successful model used by the industries whose products can become obsolete soon depending on the rapid changes in consumer preference (for making finished good inventory). But this model is not useful in the industries which have long manufacturing lead time. For example, FMCG products.

### 5. Postponement

In this practice of retail inventory management, the retailers makes the final product according to the specifications of customers. This practice was successfully used by the apparel retailers for purchasing raw fabric and for making additions such as colouring, stitching etc.

### 6. Determining a Fixed Set of Options Which Covers Maximum Customer Requirements

This practice of retail inventory management helped the retailers to reduce their inventory and fulfill the requirements of customers. The best example where this practice is used is Mc Donalds where few standard menus are available for the customers at low price.

#### 4.4.1 Problems and Prospects

#### Q12. What are the challenges faced by retail transportation?

**Answer :**

There are number of challenges faced by the retail transport managers with respect to the selection of transport mode. Some of them could be the way in which they can reduce the cost, how to deliver the products quickly to the customer etc. Every time when a customer buys a product from retail stores, he/she has to pay some transportation expenses as it constitutes the most essential element of cost. On the basis of product type, the cost of the products changes.

It is very important for the retail transport planner to make use of innovative methods for meeting the unique transportation requirements of different retail industries such as,

1. To make a frequent and just in time deliveries of products in small quantities.
2. Most of the retailers buy their source or raw materials from low cost countries, so the retail transport planner has to effectively manage the global logistics.
3. To manage the different and diverse modes and zones of transportation.

4. To reduce the lead times.
5. To enhance the significance of shipment tracking.
6. To fulfill the special packaging and building requirements.
7. To effectively meet the challenges with respect to vendor managed inventory and continuous replenishment.
8. To manage and adjust with the weather conditions and seasonal demand.

#### Q13. Discuss the problems of inventory management and prospects of retail supply chain.

**Answer :**

Every firm has to face some or the other problems relating to inventory management which may cause damage to the inventory. Some problems relating to inventory management are as follows,

1. Problems in inventory management may develop because of recruitment of unqualified employees with less experience as incharge of inventory distribution.
2. When improper evaluation of company's growth in future is done it may result in problem of overstock of inventory.
3. Problem of bad customer relations may arise when business is unable to fulfill the demands of customer due to lack of enough products in stock.
4. Because of bottlenecks and weak points inventory management system may come to an end.
5. Computer inventory systems are not so simple so this may create a problem for employees to keep an accurate record of inventory. It leads to either understock or overstock of inventory.
6. Misplacement of items in warehouse may also increase inventory costs and reduce profits.
7. Company must keep track of rise or fall in price of raw material so that price of the finished product must be fixed appropriately.

#### Prospects of Retail Supply Chain

The problems and prospects of retail supply chain deals with the challenges and emerging trends of supply chain business for small businesses. The retail supply chain has been emerging rapidly in present business scenario. The main reason behind this rapid growth is the emergence of online shopping businesses like Amazon, Snapdeal, Flipkart etc. A survey stated that, more number of product categories are available online compare to the traditional way of shopping in a shop or store. As a result, people preferring online products rather than physical store products. Thus the future prospect of retail supply chain is bright in coming years.

### 4.5 PACKAGING – MEANING AND PURPOSE

**Q14. What is packaging? What are the reasons and purposes of retail packaging?**

**Answer :**

#### Packaging

Packagings play a key role in enhancing the brand value. Brand represents value and quality of product which the customers consider while purchasing the products. The system of packaging is highly dynamic as it is designed as per the requirements of consumer. Packaging aims to promote the economical, environmental and technological significance. It is an act through which new markets can be developed.

Packaging can be defined as a combination of an art, science and technology for protecting and preserving the product from damages and helps in adding value to the finished product, enhances product's attribute so as to effectively meet the consumer needs.

The design of the packaging and its procedures come under the preview of packaging. Packaging acts as a link between production and consumption. Thus, packaging contributes significantly for the development of safe products by minimizing losses and preventing them from damages so that they can be kept for a long period of time. Products should be packed in a unique way so that one product can be distinguished from other. Packaging is a method through which company maintains effective communication with customers. So, in order to attract customers packaging should be done carefully.

The two important aspects which need to be considered while designing a product package are

1. Whether the product package is different from the other competitors package
2. Whether the product package is relevant to the product inside the package

#### Reasons of Retail Packaging

Packaging of merchandise is essential for the following reasons in the retail supply chain

1. In case of private labels, the retailer is obliged to fulfil the following responsibilities of packaging
  - (a) Package design
  - (b) Involvement of third parties for development of product design
  - (c) Delivery of packaging materials etc
2. The retailer cannot change the primary package design supplied by other companies dealing with consumer goods. The secondary packaging can be changed if retailers want the products in a specific manner.
3. The items which are imported or fragile must be properly packed by the retailer before the materials are despatched. This constitutes an essential part if the retailer has to make payments at the point of dispatch.

#### Purpose of Retail Packaging

Following are the purpose and details of retail packaging.

Purpose		Details
1	Contain merchandise	Packaging should contain merchandise that must be offered to customers for the fulfillment of their orders.
2	Ensures protection	The merchandise has to be protected from getting damage by designing appropriate packaging methods by incurring minimum cost on packaging.
3	Identification	If the packaging has visual representation of merchandise on its external cover of the package design then customer can easily identify and locate them.
4	Help sales promotion	Packaging of merchandise acts as a sales promoter by displaying price discount, free merchandise details etc. which helps to improve sales promotion.
5	Reusable-recyclable	Packaging is designed in a proper way so that it can be reused/recycled again in order to eliminate wastages.
6	Bring distribution efficiency	Packages of bulk quantities are characterized by high density and lower the transportation cost than package of small quantities. Thus, packaging requires appropriate solutions such as partial assembly of machines, use of square bottles, use of flexible packaging materials etc.

### 4.5.1 Role of Packaging – Problems in Packaging

**Q15. Explain the role of packaging in SCM. What are problems of packaging and repackaging?**

**Answer :**

*Model Paper-III, Q9(b)*

#### Role of packaging

1. Packaging plays an important role in every business. It is one of the major factors influencing the profits of the business.
2. Packaging protects the product from damages.
3. Packaging helps in differentiating one product from another product.
4. The cost of the product can be maximized with the help of proper packaging.
5. Packaging helps in providing value-added services to the customers.
6. Proper packaging design helps in increasing merchandise, shelf presence, product presentation, marketing and consumer acceptance.
7. Effective package design helps in minimizing cost for materials, handling, storage and distribution.
8. Package designs contain ingredients which helps in preparing recipe giving the details of all the items and in an easy way.
9. Packaging acts as an essential element of the product proposition.
10. Packaging helps in knowing the product validity by mentioning its manufacturing and expiry date, so that the product can be best utilized within its valid period.
11. Consumers have a wide variety of choices with different brands but while selecting product, customers prefer quality products at low cost.

#### Example

In spite of many chocolates, 'Dairy milk' is preferred by most of the customers because of its colour, taste and designs.

12. Package design also acts as a sales promoter for increasing the sales of customers.

#### Role of Repackaging

1. Repackaging is done to ensure product safety before reaching the ultimate customers.
2. Repackaging satisfies consumers and helps the firm in maximizing its profits.
3. Repackaging process helps in reducing human errors.

4. Repackaging unit in pharmacy line provides repackaging services in case the products package needs to be modified by following regulations as per the Greek labelling for products.

5. Product sorting for repackaging purpose has become easy due to innovative technology.

#### Example

Canned tomatoes seem to be available with green and red colour. But by using "photoelectric eye" technology these tomatoes can be made available in 10 different colours at a very less time. After this sorting process, again rechecking is done by the staff and finally sent for repackaging.

6. Repackaging also takes in to consideration certain factors especially related to food products which need to be in perfect condition and free from harmful effects.

#### Example

The temperature needed for one product may not be same for other products. The temperature air circulation needed for storing oranges is different from apples, bananas etc. So, in order to avoid the risk of damage, products must be stored in a temperature which is suitable to that particular product.

7. Thus, the role of repackaging helps in minimizing losses and a gain to consumers and the organization.

#### Problems of Packaging and Repackaging

The problems of packaging and repackaging are as follows:

- (i) Packaging and repackaging consumes a lot of time.
- (ii) Improper packaging and repackaging would increase the number of disappointed customers.
- (iii) The products market value may decline due to poor packaging and repackaging.
- (iv) If the packed products get damaged during transit, then the manufacturers need to allot a lot of time for the purpose of packaging and repackaging.
- (v) Repackaging process can sometime may also result in human errors.
- (vi) Ineffective packaging and repackaging would lead to maximum cost for materials, handling, storage and distribution.
- (vii) Ineffective package design would not promote sales.
- (viii) Poor packaging and repackaging does not ensure safety.
- (ix) Poor packaging and repackaging also leads to difficulty in product sorting.

**SHORT QUESTIONS AND ANSWERS****Q1. Electronic Data Interchange****Answer :***(Model Paper-III, Q2 June-17, Q1(i))*

EDI stands for Electronic Data Interchange. EDI is one of the invention in the field of Information Technology (IT). EDI is used for transferring files from one computer to other computer through telephone. With the use of EDI technology organizations can adopt JIT (Just in-Time) manufacturing system. EDI helps an organization to have a control on both inbound and outbound logistics.

The significance of EDI in SCM can be understood from the following points:

- (i) EDI reduces human involvement and increases paper less transactions.
- (ii) It reduces the data storage expenses as storage and manipulation of data is done electronically.
- (iii) EDI enables trading partners to complete the transactions quickly.
- (iv) Through EDI inventory can be reduced with efficient planning information.
- (v) Finally, EDI when joined together with artificial intelligence, results in efficient SCM.

**Q2. Cross Docking****Answer :***(Model Paper-I, Q4 June-17, Q1(ii))*

Cross docking is one of the distribution strategy used by the firms. A firm will opt for cross docking if it has many replenishment orders in hand, as cross docking will help the supplier firm in fulfilling the orders by dividing the inbound materials into small packages according to the demand or orders received.

With the help of cross docking, inbound and outbound shipments can be coordinated effectively which in turn helps in reducing the amount of inventory at retail distribution centres. In cross docking, the items will be directly transported to the store which not only enables retailers to help reduce the levels of inventory but also to reduce the lead times of supply from supplier to store. Wal-Mart is the best example where the concept of "cross docking" is used effectively for reducing the levels of inventory in retail warehouses.

**Q3. RFID****Answer :***(May/June-13, Q1(f); April/May-11, Q1(i); May/June-18, Q1(d))*

RFID stands for Radio Frequency Identification. RFID is an identification device used for describing several technologies which makes use of radio waves to identify people, place or objects through radio signals.

RFID technology has been practised since many years but it could not gain popularity due to its expensive installation and implementation. RFID technology is developing day by day and the researchers are trying to minimise the cost so that RFID can be used widely.

RFID contains a microchip inserted in a product or item in which data related to product or item is stored.

**Q4. Bar Coding****Answer :***(April-15, Q1(f); May-14, Q1(f); April/May-11, Q1(i))*

A bar code is an arrangement of black and white bars of different width, whose sequence depicts either letters or numbers. This sequence is a code, which is being translated by the scanners into useful information such as the type of product, manufacturing place, price of the product, the starting point of shipment, etc. Bar coding is a simple, useful, quicker and a correct technique which can store greater volume of information.

The bar code standards followed in one industry differs from the other industries. Bar code standards explain the language used in coding, the type of information the label holds, format of information etc. Bar code standards can be of different types like Universal Product Code and AJAG (Automotive Industry Action Group) standards. If common bar code language is used by both suppliers and manufacturers, then it becomes easy to read the product labels.

**Q5. Packaging****Answer :***April/May-08, Q1(c)*

Packagings play a key role in enhancing the brand value. Brand represents value and quality of product which the customers consider while purchasing the products. The system of packaging is highly dynamic as it is designed as per the requirements of consumer. Packaging aims to promote the economical, environmental and technological significance. It is an act through which new markets can be developed.

Packaging can be defined as a combination of an art, science and technology for protecting and preserving the product from damages and helps in adding value to the finished product, enhances product's attribute so as to effectively meet the consumer needs."

**Q6. What is Retail Supply Chain Management?****Answer :**

Supply chain management comprises of various processes and activities required for the conversion and processing of raw materials or component parts to produce finished goods that can be transferred to the end users by using an appropriate channel of distribution. Hence, supply chain is an association of several processes as product development, sourcing, manufacturing, distribution, transportation, warehousing etc. The limits of supply chain depends upon the scope of its operations which may range from direct supplier to direct customers or from its supplier's supplier to customer's customer.

Retail supply chain in India is still in its emerging stage wherein most of the retailers initially have invested in front end retailing process by setting up their stores at a good location, spending in making awareness, investing in loyalty scheme etc. But, now the trend has changed and the retailers have started investing in back end process by putting an efficient and responsive supply chain in place which would ensure quick delivery of goods at a responsible cost.

**Q7. Differentiate between Bar Coding and RFID.****Answer :***Model Paper-II, Q5*

The following are the differences between bar coding and RFID.

Bar Coding		RFID	
1	In case of bar coding, a code is printed on the product label.	1.	In RFID technology, a small microchip is inserted with in the pack.
2	The storage capacity, is less in bar coding.	2	Huge data can be stored in RFID tags.
3	Bar coding is less secured.	3	RFID technology is more secured and protected than bar coding.
4	Bar coding depends upon line-of-sight scanning.	4.	No such dependency is there in RFID technology.
5	Less expensive.	5	Highly expensive.
6.	With standard bar code language, suppliers and manufacturers can understand each other's package labels.	6.	No such standards are used.

**INTERNAL ASSESSMENT****I. Multiple Choice**

1. ICT stands for \_\_\_\_\_. [ ]
  - (a) International Communication Technology
  - (b) Internal Communication Technology
  - (c) Information Communication Technology
  - (d) Information Communication Transformation
2. \_\_\_\_\_ involves processing of various business transactions. [ ]
  - (a) Business transaction processing
  - (b) Business intelligence
  - (c) Business process outsourcing
  - (d) All the above
3. Business intelligence tools and techniques use \_\_\_\_\_ and offer various benefits. [ ]
  - (a) Data mining
  - (b) Data warehousing
  - (c) Data control
  - (d) Data processing
4. \_\_\_\_\_ plays an important role in managing information and flow of goods. [ ]
  - (a) Informal technology
  - (b) International technology
  - (c) Information technology
  - (d) Information transaction
5. \_\_\_\_\_ reduces human involvement and increases paperless transactions. [ ]
  - (a) Knowledge management
  - (b) EDI
  - (c) RFID
  - (d) Bar coding
6. RFID stands for \_\_\_\_\_. [ ]
  - (a) Radio Frequency Identification Devices
  - (b) Radio Field Interlinked Data
  - (c) Regional Force Integrated Design
  - (d) Research Field Interlinked Design

7. \_\_\_\_\_ are the elements of retail SCM [ ]
- Merchandise management.
  - Buying or sourcing
  - Sell or customer service
  - All the above
8. Delivery of a full truck load from retail distribution company to a store is an example of \_\_\_\_\_ [ ]
- Inventory management
  - Business cycle
  - Transportation cycle
  - SCM cycle
9. In order to maintain optimum level of inventory, retailers must have proper \_\_\_\_\_. [ ]
- Framework for inventory
  - Framework for transportation
  - Framework for shipment
  - None of the above
10. Packaging must contain \_\_\_\_\_ for the fulfillment of customers orders [ ]
- Merchandise
  - Sales promotion
  - Protection
  - Package design

## II. Fill in the Blanks

- \_\_\_\_\_ is a combination of two technologies
- Dialogue module, data base module and model sub-system are the components of \_\_\_\_\_
- \_\_\_\_\_ is the information system that capture knowledge and provide solutions to human expertise
- \_\_\_\_\_ is a new novel technology concept that processes immense potential to tap information resource for business entities
- Knowledge which is semi-structured in nature is known as \_\_\_\_\_
- The organizations are using \_\_\_\_\_ for decision support system
- \_\_\_\_\_ is the process where computers are used to exchange business related information
- \_\_\_\_\_ is a simple, useful, quicker and correct technique which can store greater volume of information
- Retail SCM is an important concept as \_\_\_\_\_ plays a vital role in moving products from its origin to end user
- \_\_\_\_\_ aims to promote economical, environmental and technological significance

**KEY****I. Multiple Choice**

- 1 (c)
- 2 (a)
- 3 (b)
- 4 (c)
- 5 (b)
- 6 (a)
- 7 (d)
- 8 (c)
- 9 (a)
- 10 (a)

**II. Fill in the Blanks**

- 1 Information and Communication Technology
- 2 Decision Support System
- 3 Expert System
- 4 Data Mining
- 5 Explicit Knowledge
- 6 Data Warehousing
- 7 Electronic Data Interchange (EDI)
- 8 Bar Coding
- 9 Retailer
- 10 Packaging

**III. Very Short Question and Answers****Q1. What is a Bar Code and Bar Coding?****Answer :**

A bar code is an arrangement of black and white bars of different width, whose sequence depicts either letters or numbers. Bar coding is a simple, useful, quicker and a correct technique which can store greater volume of information.

**Q2. What is EDI?****Answer :**

EDI stands for Electronic Data Interchange. It is one of the invention in the field of Information Technology (IT). It is used for transferring files from one computer to other computer through telephone.

**Q3. Write a note on Packaging.****Answer :**

Packaging play a key role in enhancing the brand value. It aims to promote the economical, environmental and technological significance and is designed as per the requirements of the customer.

**Q4. Brief on Role of Technology In SCM.****Answer :**

Information Technology (IT) plays an important role managing information and flow of goods. The emergence of different software such as EDI, RFID, ERP, WMS, bar coding etc have significantly facilitated the smooth flow of SCM.

**Q5. Write about Retail SCM.****Answer :**

Retail supply chain management is an important concept as the retailer plays a vital role in moving the product from its origin to the end user i.e., customer.

**Q6. What are the elements of Retail SCM?****Answer :**

Basically, elements of retail SCM are categorized into merchandise management processes, buying or sourcing processes, move or logistics processes and sell or customer services.

**Q7. Write a note on Transportation Cycle.****Answer :**

Transportation cycle deals with a series of activities which a retailer performs for shipping a set of articles. For example, delivery of a full truck load from a retailer's retail distribution company to a store.

**Q8. What are the components of Inventory Management Structure?****Answer :**

The components of inventory management structure for retailer include business drivers, inventory decisions and inventory management tools. These components maintain optimum level of inventory.

**Q9. What is RFID?****Answer :**

RFID stands for radio frequency identification. RFID is an identification device used for describing several technologies which uses radio waves to identify people, place or objects through radio signals.

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## UNIT

# 5

## Key Operation Aspects in Supply Chain

### LEARNING OBJECTIVES

After studying this unit, one would be able to understand.

- ❖ The Concept of Supply Chain Network Design
- ❖ Selection of Suitable Distribution Network Design in Supply Chain
- ❖ Concept and Role of Channel Design
- ❖ Various Factors Influencing Network Design
- ❖ Role and Importance of Distributors in SCM
- ❖ Role of Human Resources in SCM
- ❖ Linkage between HRM and SCM
- ❖ Concept and Issues in Workforce Management
- ❖ Relationship Management with Suppliers, Customers and Employees

### INTRODUCTION

Mostly, the functions of a firm are independent and myopic in nature. Thus, it is necessary to integrate the strategic activities of a supply chain to ensure the continuous flow of product to meet the customer's demand effectively. Designing a supply chain network is one of the strategic process of the firm which also serves the purpose of continuous flow of materials along the supply chain without any gaps. It should be aligned with supply chain strategy for taking decisions regarding the distribution channels of the firm.

Channel design refers to the involvement of an organization in logistics, production, R and D, product launch, sales channel design and other tasks. It mainly deals with analyzing customer needs, establishing channel objectives, identifying the major channel alternatives and then evaluating them.

Distributors play a very important role in supply chain management as they can effectively carry out the following functions which holds a significant impact on the firm's value and profitability.

HRM and SCM are interlinked with each other. HRM practices in SCM help in building productive relationship in the firm. Both HRM and SCM activities go side by side in carrying out the functions of the firm effectively.

### 5.1 SUPPLY CHAIN NETWORK DESIGN

**Q1. What do you mean by supply chain network design? State its objectives and challenges.**

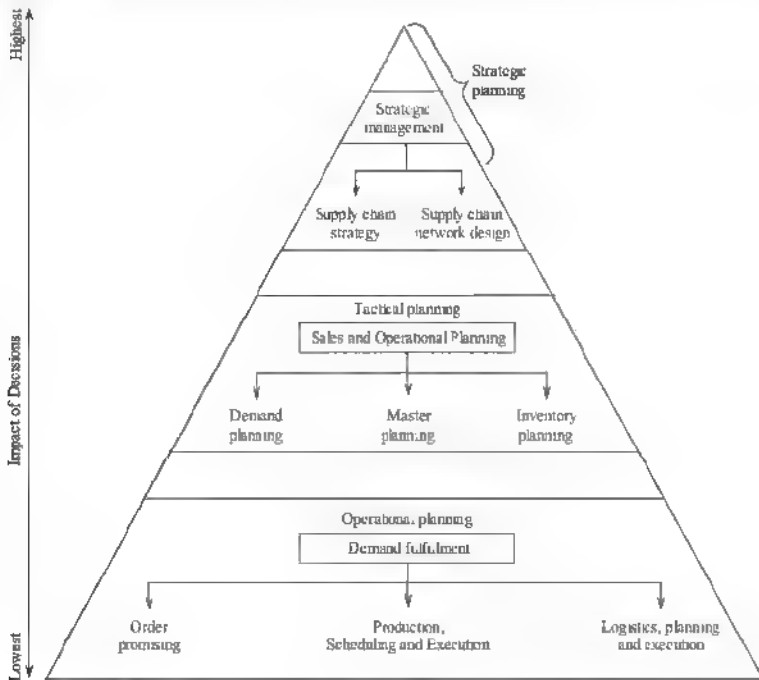
**Answer :**

*Model Paper-I Q10(a)*

#### Supply Chain Network Design

Supply chain network design is a process of determining the number of suppliers, the location of facilities, determining the product flow within the supply chain and location of distribution centres to effectively meet up the customer demand.

For the successful implementation of a supply chain strategy it becomes necessary to align the supply chain network with that of supply chain strategy of the firm. Supply chain network design occupies the top most position in the supply chain pyramid which is responsible for managing the entire supply chain at tactical and operational level.



**Figure: Supply Chain Network Design**

These decisions have a significant impact on the performance of supply chain as it plays a major role in deciding the tactical and operational processes of a supply chain thereby leading to the success of an organization.

#### Objectives of Network Design

The objectives of supply chain network design includes

- (i) To optimize the facilities located in the supply chain,
- (ii) To allocate optimum capacities and technical requirements to each facility
- (iii) To assign the sources and markets to facilitate the transportation of materials to minimum distances
- (iv) To minimize the overall costs of logistics and transportation.

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Supply chain network design decisions should support the following strategic activities of the firm.

- (a) Introduction of new product in the market
- (b) Optimal sourcing of materials
- (c) Location of manufacturing plants
- (d) Selection of target customers and location of facilities and
- (e) Number of distribution centres to be located by considering the customer convenience and cost benefits

In spite of all the above activities supply chain network design needs to maintain appropriate trade-off with the other strategies of the supply chain such as. Inventory, manufacturing, procurement, distribution etc., so as to avoid the conflict among them.

#### Challenges of Network Design

With increased global competition, firm needs to produce innovative and customized products so as to gain market share through redesigning the existing network design. Traditionally the network designs undergo the process of redesigning under rare situations. However, with the changing global market conditions, it became necessary to frequently to update the design of supply chain network according to the tastes and preferences of the customers.

The challenges faced by the supply chain network includes

- ◆ Lack of appropriate levels of flexibility in the configurational pattern of supply chain network has failed to respond to the changing demand and supply requirements
- ◆ Emergence of rapid demand for the imitation of product variety
- ◆ The difficulty in deciding upon the appropriate distribution channel

The reasons for these challenges in the supply chain network arises as a result of increased complexity in supply chain resulted from the expansion of firms operations in domestic markets to global markets. If the supply chain strategy is implemented without proper planning at the strategic level, it only increases the cost burden on the firm thereby making the entire process a complicated affair.

#### Q2. Describe the designing process of supply chain network.

##### Answer :

The main aim behind designing a supply chain network is to maximize the profitability of a firm by meeting the demands and expectations of the customers. The designing process of a supply chain network involves four phases

These phases are as follows

1. Defining the supply chain strategy
2. Defining regional facility configuration
3. Selecting desirable potential site
4. Location choices.

#### 1. Defining the Supply Chain Strategy

In this phase, the manager defines the supply chain design of a firm. This phase deals with the determination of the stages involved in the supply chain and the operational processes of a supply chain i.e., outsourcing or in-house production. The supply chain strategy aims at meeting the need and expectation of customers. It outlines the capabilities which a supply chain network must possess for supporting the company's supply chain strategy.

The supply chain manager forecasts the changing global competition and the actions of its competitors. They also identifies the constraints on available capital and determines whether the growth can be attained by acquiring the present facilities, expanding the facilities, or partnering.

#### 2. Defining Regional Facility Configuration

In this phase, the firm determines the region of the location of facilities, their roles and their capacity to allocate to each facility. The number of facilities and their location should be decided based on the demand estimations of the country, customer preferences and type of market (i.e. homogeneous or heterogeneous). In case of homogeneous markets, the firm needs to consolidate the existing facilities to a large extent and for heterogeneous markets, the firm needs to locate small facilities in each region.

The following factors need to be analyzed while deciding the number of facilities and the regions,

- (i) The impact of economies of scale of production technologies on the costs of supply chain
- (ii) Determine the demand risk, exchange rate risk, political risk, tax rates, production requirements, tax incentives and import/export restrictions in the local market.

The supply chain network design should minimize the tax rates and maximize the firm's profitability. It is also necessary for the managers to recognize the number of competitors in each region before deciding to locate the facilities near or far from their locations.

By analyzing all these factors, the managers can determine the regional facility configuration which outlines the required number of facilities in the network and the location of facilities to meet the customer's needs effectively.

In this phase, the objective of a supply chain manager is to maximize after tax profits. He should consider the trade-off between cost and revenue while designing the supply chain network. For designing the supply chain network effectively, firm can use number of network design models. The network design models can be used in the following two conditions

- To take the decisions related to location of facilities
- To take the decisions related to the capacity to be allocated to each facility

The network design models which are used by the includes network optimization models and gravity location models.

#### Network Optimization Models

The location of the facilities should be decided by analyzing the market demand, tariff rates, economies of scale, and the costs incurred in the maintains of facilities. The two options which are available for facility location are as follows

- Establishing facilities in each region to reduce the transportation cost and import-export tariffs, and
- Consolidating the plants in few regions as it enhances economies of scale but increases the transportation costs.

In these models, the data which can be used for quantitative model, is collected and analyzed for determining the fixed and variable costs incurred for each alternative. The main objective of the supply chain team is to maximize the profits after taxes. But, if the taxes are ignored and the objective function is to minimize the cost, then the problem can be solved using the integration programming model.

#### Objective Function

$$\text{Min } \sum_{a=1}^n F_a B_a + \sum_{a=1}^n \sum_{b=1}^m C_{ab} X_{ab}$$

#### Subject to (STC)

$$\sum_{a=1}^n X_{ab} = D_b \quad B_a \in \{0, 1\}$$

$$\sum_{b=1}^m X_{ab} \leq K_a B_a \quad a = 1, 2, \dots, n$$

Where

$n$  = Number of plants/facilities

$m$  = Number of markets

$a$  = Location 'a'

$b$  = Market 'b'

$\lambda_{ab}$  = Quantity shipped from plant to market 'b'

$B_a$  = 1 if plant is open, or else '0'

$F_a$  = Fixed costs incurred on plant 'a'

$K_a$  = Potential capacity of plant 'a'

$D_b$  = Demand in the market 'b'

$C_{ab}$  = Cost of producing and shipping one unit from factory 'a' to market 'b'

#### 3. Selecting Desirable Potential Sites

In this phase, the firm selects a set of potential sites in each region for the location of facilities. The selection of site for plant location is made by analyzing the infrastructure facilities which are available to meet the market demand. The infrastructure requirement are of two types.

- Hard infrastructure requirements includes suppliers availability, transportation facilities, communication, utilities and warehouses
- Soft infrastructure requirements includes skilled labour availability, workforce turnover, and community receptivity to business and industry.

In this phase, gravity location models are used for determining suitable sites for facility location which can minimize the transportation cost for shipment of materials from suppliers and finished goods to the customers.

The site which is selected should also minimize the distance covered from facility to source and destination. In this model, the costs and distances for all the available opportunities are determined and then the best possible site is selected.

The distance between the facility and source/market 'm' i.e., given by,

$$d_m = \sqrt{(x - x_m)^2 + (y - y_m)^2}$$

Where

$x_m$  and  $y_m$  = Coordinate location of either market, source

$f_m$  = Fixed costs for shipment

$D_m$  = Demand required by plant and market

$x$  and  $y$  = location selected for facility

Transportation cost can be determined using,

$$TC = \sum_{m=1}^M d_m D_m F_m$$

In this phase, the manager should to consider the service factors such as response time, product availability, time to market, customer experience etc., while selecting the site for locating facilities.

4. Location Choices

In this phase, the supply chain manager need to identify the exact location and allocation of capacity to each facility. He should focus more on the potential sites which are selected in the previous phase. By considering the margin, market demand, total logistics costs, tax rates, factory costs etc. The manager can design the network which maximizes the profitability.



Figure: Framework for Designing Supply Chain Network

5.1.1 Distribution Network in Supply Chains

Q3. Explain how a design manager can select the suitable distribution network design.

Answer :

While selecting the suitable distribution network design, the managers are supposed to take into consideration the product characteristics and the network requirements. The following table (1) helps in summarizing the performance of the different distribution options on different dimensions with the help of a ranking scale ranging from 1-5. '1' represents the best performance and '5' represents the worst performance.

Design Dimension	Direct shipment with manufacturer to customer	Direct shipment with intransit merge	Distributor storage with package carrier	Distributor storage with last mile delivery	Manufacturers/ distributor storage with pick up	Retailer storage with customer pickup
<b>Cost Factors</b>						
Inventory costs	1	1	2	3	1	4
Transportation costs	4	3	2	5	1	1
Facility costs	1	2	3	4	5	5
Information costs	4	4	3	2	5	
<b>Service Factors</b>						
Response time	4	4	3	2	4	1
Product variety	1	1	2	3	1	4
Product availability	1	1	2	3	1	4
Time to market	1	1	2	3	1	4
Customer experience	4	3	2	1	5	1-5
Order visibility	5	4	3	2	5	1
Returnability	5	5	4	3	2	1

Table

Some niche firms makes use of any one of the distribution options whereas most of the firms usually goes for the combination of different designs in order to gain more cost benefits and value. For the combination of the design it is quite essential to coordinate the distribution network with the firm's strategic position. The following table (2) summarizes and adaptability suitability, of different design options in different situation. Example, WW Grainger is one of the firms using combination of all the network design to fit the firm's situation and better suit the customer needs. The fast-medium moving items need to be shipped immediately and the slow moving items can be dropped with the help of drop shipping slowly.

Design options Different conditions	Direct shipment (or) Drop shipping	Direct shipment with intransit merge	Distributor storage with package carrier	Distributor storage with last mile delivery	Manufacturers/ distributor storage with pick up	Retailer storage with customer pickup
High demand product	5	4	3	2	4	1
Medium demand	4	3	2	3	3	2
Low demand	2	3	2	4	2	4
Very low demand	1	2	3	5	4	5
Many product sources	4	4	1	2	3	2
High product value	1	2	2	3	2	4
Quick desired response	5	5	4	2	5	1
High product variety	1	3	2	3	1	4
Low customer effort	2	1	1	1	4	5

Where,

1 = Most appropriate, 2 = Slightly appropriate, 3 = Neutral

4 = Slightly inappropriate, 5 = Most inappropriate

#### Example

- Amazon, used warehousing and drop shipping designs.
- Gateway used retail stores with pickup and drop shipping

#### Q4. What are the factors influencing distribution network design?

**Answer :**

The performance of a distribution network of a supply chain depends on the ability of the firm to accomplish the objective of meeting the needs and expectation of the customers effectively at low cost. Thus, the performance of a distribution network can be evaluated with the help of the following two dimensions:

- The degree to which the customer's needs are fulfilled and
- The cost of meeting the needs of the customer's

These dimensions act as the basis for differentiating the distribution network options and also have a significant impact on the firm's profitability.

A manager should consider the following measures of customer service which are affected by the structure of distribution network while designing the distribution network.

- Response time
- Product variety
- Product availability
- Customer experience
- Time to market
- Order visibility
- Returnability

#### (a) Response Time

Response time is the time taken for delivering the order to customers.

#### (b) Product Variety

Product variety means the variety of products which are offered by the distribution network.

#### (c) Product Availability

Product availability means the chances of having a product in the warehouses to meet the customers' demands.

**(d) Customer Experience**

It means the ease with which the customer's places and receives the orders and the degree to which this experience is customized.

**(e) Time to Market**

It means the time taken for introducing a new product in the market.

**(f) Order Visibility**

It means the ability of the customers to track their orders from placement to delivering.

**(g) Returnability**

It is the facility provided to the customers to return the damaged goods to the firm.

Thus, in order to satisfy the needs of the customers, the firm need to perform effectively in all the above aspects. The firms which prefer customers who gives importance to short response time should be located close to them. These firms establishes number of facilities each with low capacity in their network. On the other hand, the firms which prefer customers who are ready to tolerate long response times needs only few locations which can be far from the customer. These firms can increase the capacity of each location the figure given below depicts the relationship between desired response time and number of facilities.

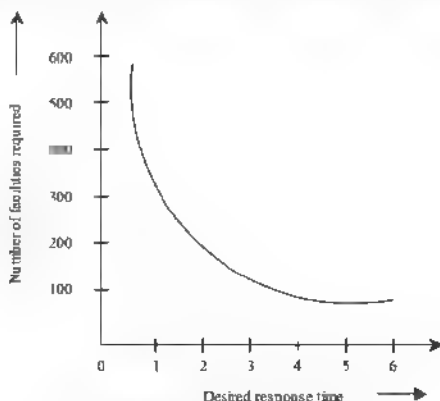


Figure (1): Impact of Number of Facilities on Response Time

In the figure (1), it can be seen that a decrease in the desired response time increase the number of facilities needed in the network. The following logistics costs are effected by the changes in the distribution network design.

- (i) Inventory costs
- (ii) Transportation costs
- (iii) Facility costs
- (iv) Information costs
- (v) Logistics costs

**(i) Inventory Costs**

Inventory costs of a firm increases with an increase in the number of facilities in the supply chain. In order to reduce the inventory costs, firm should reduce the number of facilities in their supply chain network.

**(ii) Transportation Costs**

Transportation costs are of two types i.e., inbound transportation cost and outbound transportation costs. The costs which are incurred on getting the materials into warehouse are called as inbound costs whereas the costs which are incurred on shipping the material from warehouse to the delivery point are called as outbound costs.

Generally, the outbound costs are higher than the inbound costs as the inbound lot sizes are of greater quantities. By maintaining economies of scale in inbound shipment the increase in the facilities reduces the transportation costs.

**(iii) Facility costs**

A firm can reduce the facility costs by reducing the number of facilities located in the supply chain network. This in turn helps the firm to maximize the economies of scale.

**(iv) Information costs**

For better maintenance of distribution network, the firm should depend on the information technology which requires high costs.

The figures given below depict the relationship between the number of facilities and inventory costs, transportation costs, facility costs & logistics costs.

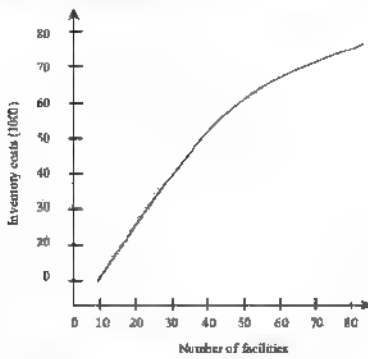


Figure (2): Relationship between number of facilities and inventory costs

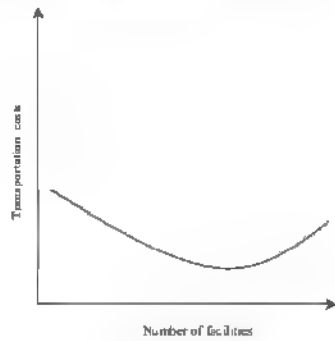


Figure (3): Relationship between number of facilities and transportation costs

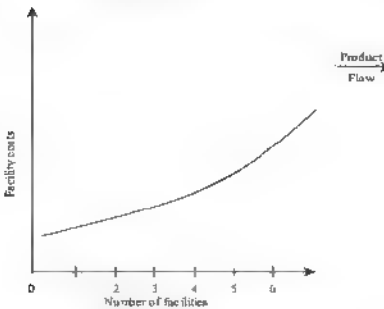


Figure (4): Relationship between Number of Facilities and Facility Costs

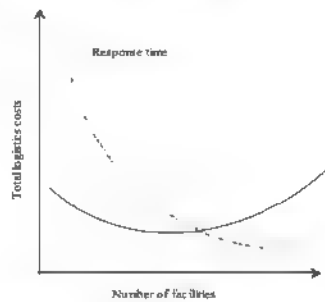


Figure (5): Variation in Logistic Costs and Response with Time Number of Facilities

**(v) Logistics costs**

The sum of inventory, transportation and facility costs for a supply chain network is the total and logistics cost. With an increase in the number of facilities, the total logistics costs firstly decreases and then increases. Every organization must have at least the minimum number of facilities which reduces the total logistics cost. If a firm further desires to decrease the response time to its customers, then it should increase the number of facilities beyond the cost minimizing point. If a firm is assured that the increase in revenues due to better responsiveness is more than the increase in costs due to additional facilities, then it must add the facilities beyond the cost minimizing point.

Hence, it is very essential for the firms to assure that the strengths of the distribution network matches with the strategic position of the firm.

**Q5. What are the options in distribution network?****Answer :***(Model Paper-II, Q10(a) | May/June-16, Q6(a))*

All the supply chain participants need to design the distribution network which minimizes the logistics cost. Manager needs to consider the two key aspects while designing the distribution network.

1. Either to deliver the products to the customers or to receive the materials from the suppliers.
2. Presence of intermediaries in product flow.

After analyzing these two aspects, firm chooses anyone of the following six options of the distribution network designs.

1. Direct shipment from manufacturers to customers.
2. Direct shipment with in-transit merge.
3. Distributor storage with package carrier delivery.
4. Distributor storage with last mile delivery.
5. Manufacturer/distributor storage with customer pickup.
6. Retail storage with customer pickup.

Each alternative can be discussed in detail as follows.

**1. Manufacturer storage with direct shipping**

In this alternative, the product directly flows from the manufacturers to customers directly without the support of any intermediaries. In this option, orders are received from the customers by manufacturers through retailers i.e., information flows through the manufacturers and then to customers with the help of retailers. Manufacturers  $\xrightarrow{\text{Product Flow}}$  customers,

$\xrightarrow{\text{Order}}$  Retailers  $\xrightarrow{\text{Order}}$  Manufacturers information flow. Direct shipment from manufacturers to customers is also termed as "Drop shipping".

**Example**

On-line networks eBags and Nordstrom.com used drop shipping for the shipment of goods.

Direct shipping centralizes the inventory at the manufacturers by aggregating the demand from different retailers who are supplying the products to various firms. It facilitates the shipment of product possessing the following characteristics:

- (1) High value (2) Slow moving items and (3) the products with low and unpredictable demand.

The aggregation of demand may not be advantageous for the shipment of high demand and low value products whose demand is predictable. Drop shipping also requires the integration of information between the retailers and the manufacturers.

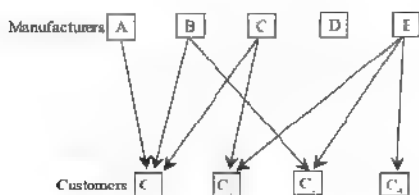


Figure: Product Flow

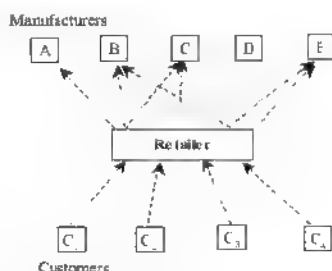


Figure: Information Flow

### 2. Direct Shipment with Intransit Merge

In this option, the distribution network involves an intransit carrier in addition to the traditional mode of drop shipping and Intransit carrier receives several lots from different manufactures and combines them so that they can be delivered to the customers in single shipment order. This option can overcome the limitation of different lead times in direct shipment. Products from different manufacturers are first received by the carrier and then they are delivered to the customers. Information flows from the manufacturer to the customer through retailers.

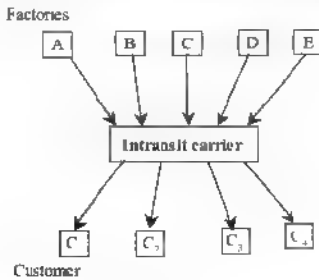


Figure: Product Flow



Figure: Information Flow

#### Example

Firms A and B are involved in producing different parts of a product. Instead of shipping the individual components directly to the customers at different time periods, it is better to ship them to a carrier hub wherein the parts can be assembled and delivered to the customers in a single shipment.

Products having low to medium demand whose demand is unpredictable can be better shipped through in-transit carrier. Intransit carriers can perform better if the material received from different manufacturers are high and belong to the limited sourcing locations.

### 3. Distributor Storage with Package Carrier Delivery

This type of distribution network is similar to the manufacturer storage but differs in the location of inventory. Unlike manufacturer's storage, the inventory is stored at the warehouse of distributor or retailer from which it gets transported to the final customer. Distribution from warehouse to customers involves package carriers.

#### Example

Amazon, www.garinger etc., are some of the companies which are making use of this approach for distribution in combination with drop shipping.

Distributor storage is best suitable for medium to fast moving items and for those products which are having high demand. Distribution warehouses require high levels inventory to meet customer demand. Information flow in this approach is from customers to distributor/retailer.

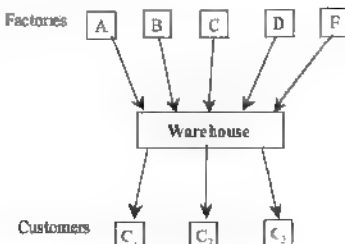


Figure: Product flow

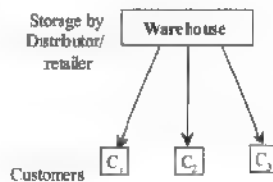


Figure: Information Flow

#### 4. Distributor Storage with Last Mile Delivery

Unlike package carrier, last mile delivery offers products directly to customer's home. For example, Webran, Peaped, Domino's provide home delivery services in grocery industry. In this type, distributor warehouses are located very close to the target customer segment. In this approach, number of facilities are more to serve the customers located in a specific geographical area. Last mile delivery distributor's storage requires high inventory levels which helps the firm in suiting the shipment of fast moving items. The product and information flows are similar to other distributor's storage type. It is advisable for a supply chain to use last mile delivery in combination with the package carrier delivery to achieve economies of scale.

##### Example

A firm establishes its stores at different locations and employs labor for the prompt delivery of services to the target customers.

This approach suits best for serving the customer orders which are specific for the high demand products.

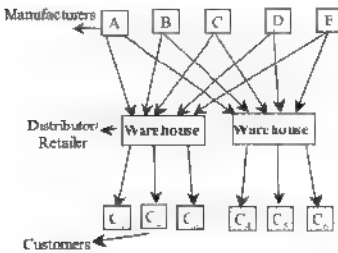


Figure: Product Flow

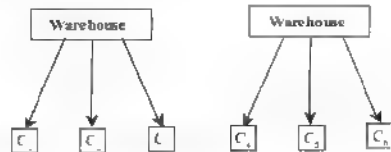


Figure: Information Flow

#### 5. Manufacturer/distributor Storage with Customer Pickup

In this type, either the manufacturer or distributor is responsible for storing the inventory. In this type, the customer can place order on-line or on phone with manufacturer/distributor and then need to pickup their orders from the respective pickup stores/sites. Here, manufacturer/distributor need to maintain inventory at pickup points.

##### Example

Granger has established number of pickup sites which plays a vital role in fulfilling the customer orders.

This approach has eliminated the home delivery services there by reducing the delivery costs. For an effective network, it is necessary to design the pickup sites ensuring easy pickup.

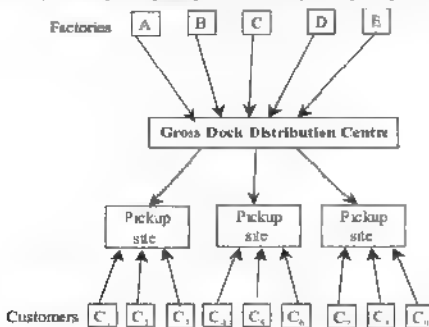


Figure: Product Flow

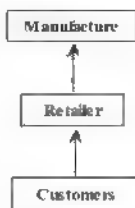


Figure: Information Flow

### 6. Retailer Storage with Customer Pickup

This constitutes the traditional approach in which investment is stored at retail stores. In this type, the customer places an order either in person or on phone or online and needs to pickup order from the respective retail stores. In this option, delivery system is eliminated.

#### Example

Big Bazar, Reliance Fresh etc. This approach suits best to fast moving items and products with high value.

### 5.1.2 Channel Design – Factors Influence Design

**Q6. What is channel design? Explain the role of channel in developing integrated logistics strategy.**

**Answer :**

*Model Paper-III, Q10(a)*

#### Channel Design In Developing an Integrated Logistics Strategy

Channel design refers to the involvement of an organization in logistics, production, R and D, product launch, sales channel design and other tasks. It mainly deals with the analyzing of customer needs, establishing channel objectives, identifying the major channel alternatives and then evaluating them. Channel design follows a structured approach by making use of the certain criteria which is used to evaluate optimal channel structures.

#### Role of Transaction Channels in Developing an Integrated Logistics Strategy

The following figure represents the importance of transaction channels in the overall development of an integrated logistics strategy. Market coverage and product characteristics are the important dimensions of both transaction channels and physical distribution channels.

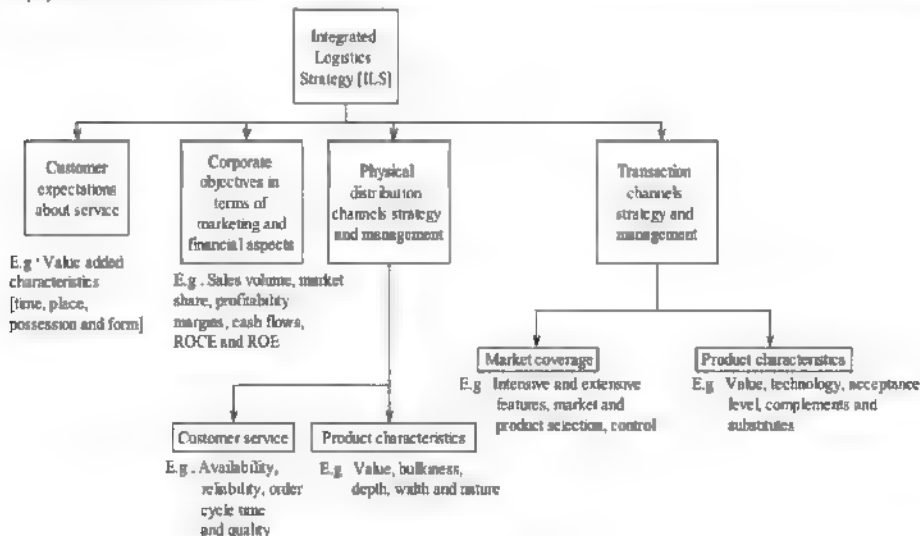


Figure: Role of Distribution Channel in an ILS

#### 1. Market Coverage

It is an important criteria during the selection of an intermediate channel by the suppliers. The suppliers must select only those channels that matches with the expectations of customers. Products can be distributed through intensive or exclusive modes.

##### (a) Intensive Distribution

It is mainly used for the transfer of everyday used products and consumable industrial products, where the purchasing pattern is favorably short-term, as customers will be maintaining considerably less stock than they do for other types of products.

**(b) Extensive Distribution**

It involves partnership where an intermediary act as a "franchisee", while a "franchiser" is a focal firm. Such a partnership helps in providing mutual support and also in the development of sales. This type of distribution is favourable for the sale of consumer products wherein customer desires for a wide range of selection.

**(c) Selective Distribution**

This type of distribution is usually used by a focal firm, if it has to provide products only to a limited range of customers. Usually, the markets being served are very large, hence their decisions are affected by the nature of service and after-sales service offers for maintaining good customer relationships.

**(d) Outlet Selection**

Outlet selection adds complexity to the entire logistics strategy. Outlet selection is mainly dependent on the nature of products and their characteristics. For example, products such as convenience type whose investment in inventories is less and whose fixed capital can not be considered, requires less factor consideration for outlet selection than that of expensive consumer products or high-tech industrial items.

**(e) Market Control**

Suppliers function can be controlled by developing a control device which identifies the critical success factors responsible for maintaining effective channel partnership structure required for the operations of channel partnerships.

Thus, any activity that could or should be performed by the suppliers holds an impact on the cost profiles of retailers which can be used as a selection criterion.

**2. Product Characteristics**

Selection decisions of channels are also influenced by the characteristic features of products. For example, size, quality, reliability etc., constitutes the product characteristics.

**(a) Value**

Value of a product is an important dimension. Value is directly proportional to the amount of working capital required in supply chain. As, value and the sales turnover are correlated, stockholding and cash flows required for maintaining inventory levels determining the service level expectations influences the need for intermediaries. It also influences the physical distribution channel as shown in figure.

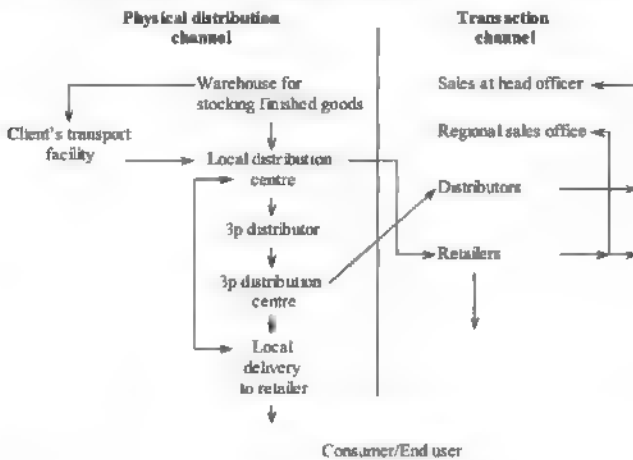


Figure: Coordination and Integration of Physical Distribution Channel and Transaction Channel

**(b) Technology**

Other factor influencing distributor selection is the technology. Complex products require additional investment in terms of specialized equipment and service parts inventory. These are additional costs that the firm has to bear apart from the cost of inventory.

**(c) Consumer Acceptance**

Consumer acceptance or brand awareness plays an important role in determining the extent of efforts that has to be put forward by the firms for the sale of products. Such efforts could be less if the firm introduces new products to the existing range of products. Whereas huge efforts are needed for new brands introducing new products as for their promotions, firms have to pay bonus to the distributors and retailers.

**(d) Product Complements**

It becomes a usual phenomenon for distributors to produce innovative product range. If distributor has a complementary product with the existing market products, then their sale would be beneficial to both suppliers and distributors. Even, such type of products increases the average customer transactions by increasing the overall sales volume.

**(e) Product Substitutes**

Product substitutes are available for competitive products, which places a premium on shelf space and other POS displays in case of intense customer areas.

**Example**

This is mostly seen in case of convenience products that have low-brand loyalty and low purchase prices.

Even, they have an influence on the trade margins of low-brand loyalty products which require higher margins as incentives. A specialist distributor helps in making the entire logistical activity as an easy task and also enable suppliers to provide effective support to the focal firm.

Thus, a logistics manager needs to consider all the above mentioned factors while developing an integrated logistics strategy.

**Q7 What is channel management? What are the factors influencing channel design?**

**Answer :** (Model Paper-I, Q10(b), April-15, Q6(a))

**Channel Management**

The channel management generally includes all the activities which are involved in the distribution function of a firm. For the purpose of decision making, distribution strategy provides guidelines. The distribution management function deals with the implementation of the distribution strategy of the firm. Channel management involves three broad phases which are as follows:

Use of power bases

2. Identifying and resolving channel conflicts.
3. Channel coordination

**1. Use of Power Bases**

The power bases can be used for implementing and managing the channels. The channel system includes those players who are not motivated equally to execute the idea, channel design as their expectation from the channel might vary. Effective utilization of power bases helps in buying different channel partners in line for the execution and effectiveness of the channel.

**2. Identifying and Resolving Channel Conflicts**

A channel conflict mainly occurs when the specific actions of any channel member acts as an obstacle for the entire channel, for attaining its objectives. There are mainly three reasons behind the occurrence of channel conflicts which are as follows:

**(i) Goal Conflict**

As different channel members understand the channel objectives in different ways, goal conflict occurs.

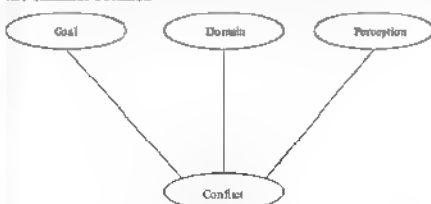
**(ii) Domain Conflict**

Domain conflict occurs when the channel members comprehend their responsibilities and authorities in different manner.

**(iii) Perception Conflict**

Perception conflict occurs when the channel members understand the market place differently and initiates the actions which do not match with the market.

In all the above cases, there is a mismatch in the channel members performance which in turn leads to conflict and influences the attainment of the ultimate goals of the channels. It is very essential for the sales manager who manages the channel to recognise the sources of the channel conflict and to take appropriate measures for setting the channel conflict.



**Figure: Types of Channel Conflict**

Generally, either one (or) a combination of many channel powers can be used by the channel manager for setting the channel conflicts.

### 3. Channel Co-ordination

The sales manager needs to make sure that the channel system which he is operating is effectively coordinated particularly when the channel conflict occurs and the channels are in operation.

A channel system is considered to be effectively co-ordinated if each channel member comprehends his role more efficiently and performs it to assist the whole system to attain its customer services objectives. The coordinated channel protects the interests of each channel members, assures that the actions of all the members are in line with the objectives of the channel and streamlines the channel flows for delivering the customer service objectives as expected by the end customers.

The channel co-ordination is a continuous efforts which considers the customer requirements, the manner in which the markets and competition behave and the strengths and weakness of the channel partners.

#### Factors Influencing Network Design Decisions

The following are the various factors that affects the supply chain network design decisions.

- (a) Strategic factors deal with the competitive strategy of a firm which focus on cost leadership, high responsiveness, easy access to customers etc.
- (b) Technological factors include economies of scale of production technology and flexibility of production technology.
- (c) Macro economic factors include tax rates, tariffs, exchange rates, demand risk and other economic factors which are external to an organisation.
- (d) Political factors includes the political stability of the country and the legal systems of the countries.
- (e) Infrastructure factors deal with the availability of good infrastructure facilities such as site, labor, transportation and communication.
- (f) Competitive factors include the competitor's size, strategies and location of their facilities.
- (g) Socioeconomic factors deal with the development of industrial policy and maintenance of balanced regional development.
- (h) Operational factors include the logistics costs such as transportation, inventory and facility costs and the local presence of the facilities.

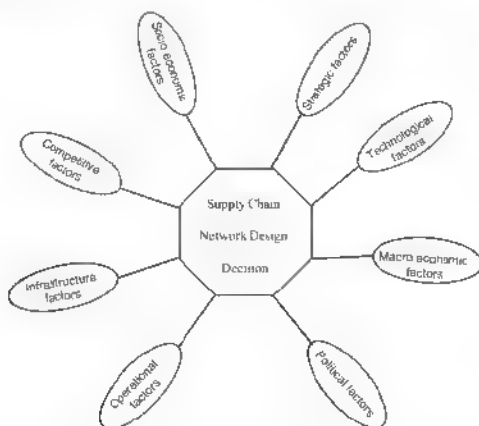


Figure: Factors influencing Network Design Decisions of a Supply Chain

## 5.2 ROLE AND IMPORTANCE OF DISTRIBUTORS IN SCM

**Q8. Explain the role and importance of distributors in SCM.** (May-14, Q6(a); May/June-12, Q6(a))

OR

**Discuss the role and importance of distribution in supply chain management.**

**Answer :** (May/June-13, Q6(a))

### Role of Distributors in Supply Chain Management

Distributors play a very important role in supply chain management as they can effectively carry out the following functions which holds a significant impact on the firm's value and profitability. The following are the functions of

- Selling and promotion
- Buying and building product assortments
- Bulk breaking
- Value-added processing
- Transportation
- Warehousing
- Merchandising
- Marketing information
- Sequencing

#### (a) Selling and Promoting

Distributors play a significant role in selling the products with the help of different place and promotion strategies. Manufacturers cannot go each and every where and communicate their products to customers who are located in far away areas from the manufacturing plant. In order to avoid this, the firms can choose any one of the following strategies

- To hire sales staff and creating their own marketing channel in order to directly meet the customers who can control the products, price and marketing activities but cannot control the inventory's carrying cost, wages for sales staff, plant maintenance and so on.
- To use a wholesale distributor for direct selling. In this type of strategy the distributor needs to have complete knowledge about customer's needs and expectations in order to meet them effectively by enhancing the place, time and possession utilities. This facilitates the manufacturer to reach the customers of the far away areas, reduce costs and increase the emphasis on manufacturing processes. But it is not possible to control prices, promotions, direct information flow and may also fail to meet the customers' expectations.

#### (b) Buying and Building Product Assortments

This function is quite essential for the retailers in order to offer or provide product assortments to best fit their merchandising strategy and to meet customer demand at low cost. Product assortment offers the benefit of sourcing different mix of materials from single supplier which would help in reducing the purchasing, transportation and merchandising costs. Distributors play a major role in maintaining product assortment and can assemble different products from different sources according to the customer's requirements and provide value added delivery services at the minimal cost.

#### (c) Bulk Breaking

The procedure of break bulk is completely opposite to the procedure of consolidation. It is found to be the most favorable mode for the storage of volume shipments. This method is applied for the transfer of goods when the quantity ordered by the customer is less and also when the distance between the customer and producer is more. It is commonly seen in terminal or distribution warehouse, particularly when the per unit rate of inbound transportation is less than the per unit rate of outbound transportation as in figure (3).

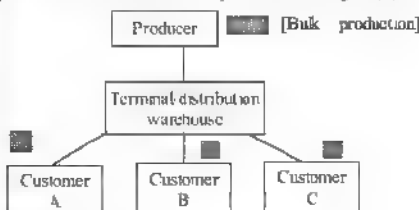


Figure (3): Break Bulk Storage

#### (d) Value added Processing

The present day distributors are greatly involved in converting the finished products derived from the manufacturers into their final form with the help of sorting, labeling, blending, kitting, repackaging, final assembly processes. All these functions are effectively carried out by the distributor in order to provide value added services to the customers or retailers. The value added processing basically lies on the principle of 'postponement' which refers to the process of reducing the risk of carrying the finished forms of inventory by delaying the product differentiation in the supply chain channels in order to reduce the risk of carrying inventory along the whole supply chain. Value added processing would not only help in reducing the storage and transportation costs but also helps in reducing the product obsolescence.

**(e) Transportation**

Transportation is the most important function of a distributor i.e., the movement of goods from source to destination (retailer). In order to have good transportation function, the distributors need to manage both time and place utilities for gaining higher customer satisfaction. Otherwise on the other hand it would result into loss of sale, increasing levels of customer dissatisfaction and increased order processing costs. Firms can either maintain its own transportation fleets or make use of contract carriers for transportation of materials quickly at low cost and also at the time maintaining the consistency. These functions can be carried out effectively by the wholesale distributor who holds a close relationship with the customers own fleet and expertise in transportation than that of manufacturers.

**(f) Warehousing**

Distributor should maintain warehouses to possess required inventory to meet the customer demand and also a portion of buffer stock to meet unanticipated demand from customers. Warehouses can facilitate the distribution of products to potential customers located in wide geographical areas thereby reducing transportation costs. Distributor possessing logistics skills and a knowledge of customer needs and markets can better meet the customers than manufacturers and also reduce inventory levels in warehouses.

**(g) Sequencing**

Distributors also carry out the function of sequencing when the finished goods get closer to the customers by sorting them into required lots or kits for the convenience of customer in order to receive the required goods in single delivery. Sequencing of materials can also help the manufacturers to receive different materials in sequential order of their usage for production process to adjust adept to the assembly schedule. Sequencing helps in reducing the transportation costs. It also provides the customer with delivery services and cost effective process. Thus, it is most profitable to make use of the distributor's service who are experts in these services.

**(h) Merchandizing**

Usually, in majority of the cases, the finished products delivered from the manufacturing site are not ready for the customer's delivery. They further need additional modifications such as bulk break, sequencing, packaging, repackaging, assembly and so on. Merchandizing can be carried out effectively by the distributor along with the retailers who provide the best product and service mix in order to match the promotion strategies.

**(i) Market Information**

For a strong supply chain, the firms need to collect the adequate and reliable information with respect to the customer's needs and local markets. Distributors play a major role in gathering reliable marketing information for serving this purpose.

**Importance of Distributors in SCM**

For answer refer Unit-V, Page No. 517, Q.No. 9

**Q9. Explain briefly the importance of distributors in supply chain management.****Answer :**

In a strategic supply chain distributor acts as a supply chain coordinator who effectively manages the supply chain activities on the basis of the poor assessment of past data, it leads to unfamiliar results of wholesaler-distributor role in future. However, the distributors of trade associations are involved engaged in the activity of preparing the reports inclusive the impact of the operational performance of the supply chain. The reason for the pessimistic preparation of reports with respect to the distributor's role is consolidation due to the increased impact of IT in distribution with the increase in changing customer needs and expectations. The firms need to utilize the sophisticated IT system for exploiting the economies of scale in order to match the high investments in the implementation process of IT systems.

Currently, most of the wholesaler distributors are getting vanished away due to the acquisition being made by the well established firm for the purpose of enhancing their business share. Eventhough, consolidation helps in reducing the number of distributors but still it helps in developing and improving wholesale distributors future in trade.

In traditional supply chains the low levels of industry concentration would result to lead increased levels of competition between the wholesale distributors functioning in geographically distinct markets which effects only a small proportion of the national sales. It is not possible to determine the nature and level of concentration in a particular region with the help of apparent fragmentation of wholesale distribution. The supply chain of a famous and leading manufactures cannot be effective without a wholesale distributor because the manufacturer cannot directly communicate with the customers whereas distributor can better serve this purpose as they have cordial relations with customers possess detailed knowledge about the customer needs, local markets and their trends.

### 5.3 ROLE OF HUMAN RESOURCES IN SCM - LINKAGE BETWEEN HRM AND SCM

**Q10. Explain the role of Human Resources in SCM and linkage between HRM and SCM.**

OR

**"Human resources play a great role in SCM". Discuss with reference to retailing.**

*(Refer Only Topic: Role of Human Resources in SCM)*

**Answer :** *(Model Paper-III, Q10(b) May/June-13, Q6(b))*

#### Role of Human Resources in SCM

Human resource plays a key role in supply chain management. Supply Chain Management (SCM) is the management of supply chain activities such as procurement, manufacturing, sourcing and other inventory management activities. Effective management of supply chain helps the organization in gaining competitive advantage over other competitors. The various parties involved in SCM are suppliers, vendors, distributors, wholesalers and retailers. On the other hand, Human Resource Management (HRM) is all about managing people and it is also one of the way to achieve competitive advantage.

#### Linkage between HRM and SCM

HRM and SCM are interlinked with each other. The relationship between these two can be understood from the following points,

1. HR activities are a must in any firm. This forces the SCM partners to take up the HR practices which results in effective way of achieving competitive advantage.
2. HRM practices in SCM can also help in building productive relationship in the firm.
3. Both HRM and SCM activities go side by side in carrying out the functions of the firm effectively. The role of HRM in SCM are as follows,
  1. Training and development activities for supply chain professionals.
  2. To initiate the role of incentive pay system in supply chain management.
  3. To take up welfare measures in SCM.
  4. Using HRM practices in supply chain management to work more efficiently.
  5. To influence organizational culture and its impact on supply chain activities.
  6. To use outsourcing strategy in supply chain to outsource the staffs of supply chain.
  7. To enhance work force relationship among supply chain partners.

8. To facilitate retention programs in SCM.
9. To ensure health and safety measures in SCM.
10. To enable work force diversity in supply chain.
11. To face competitive challenges in SCM.

### 5.4 ISSUES IN WORKFORCE MANAGEMENT

**Q11. What is workforce management? What are the issues in workforce management?**

OR

**What are the various issues involved in workforce management?**

*(Refer Only Topic: Issues in Workforce Management)*

**Answer :** *(May/June-13, Q6(b))*

#### Workforce Management

Workforce management is a process which is used by a public or private entity to optimize the productivity of employees at all the levels of the organization. It helps in staff planning and optimization. It is usually applied to staffing the customer support center. WFM deals with optimizing staffing levels in terms of both numbers and skill sets. Workforce management tools can analyze historical call types and volumes and help suggest optimal center staffing. It quantify the amount and type of labour required to do a particular job on a hourly or daily basis.

#### Issues in Workforce Management

Although, the issues involved in labour relations management are almost same in all the countries, the solutions to these issues/problems differ from one country to another.

From the past few years, a number of changes have been taken place in the labour market. Some of the changes were, shift from full-time employment to part time employment, more importance was given to service sectors than manufacturing sectors, changes in the nature of work force, working patterns, structure of an industry etc.

Apart from the above changes, the other important changes that have been taken place in the labour market are,

- (a) The percentage of women employees in the organization is found to be increasing day-by-day.
- (b) Labour-intensive manufacturing firms started using IT (Information Technology) in their day-to-day operations.
- (c) An increased growth rate is new employment patterns i.e., working in night shifts and week ends.
- (d) An increasing demand for part time casual employments resulted in an introduction of a secondary labour market, where individuals started working according to the requirements of an organization.

The following are the responses to the above changes trends in the labour market.

1. Early retirement schemes are started in the government organizations.
2. Political debate arises on account of privatization of public sectors.
3. Legislative protection is low in case of employment.
4. Eligibility criteria with reference to age-limit is given due to importance in recruitments.
5. Increased negotiations with respect to deregulation in the labour market.
6. Negotiations with respect to immigration policies.
7. Increasing employment in night shifts, lengthy working hours with minimum penalties.

Some of the modern issues concerning labour relations management are,

1. Increase in the growth rate of service sectors such as banking, travel and tourism sector etc.
2. The functioning of the manufacturing firms are restricted only to the domestic markets.
3. Shift in the employment pattern from full-time employment to part-time employment, lengthy working hours, work shifts, temporary jobs etc.
4. Low birth rate.
5. Reduced participation of the trade unions during the resolution of work related issues.
6. The percentage of women employee is increasing.
7. Changing demand patterns need flexibility in the workforce.
8. The states which are providing welfare measures to their citizens during difficult employing situation.

Thus, the trends discussed above will have an impact on the various institutions of labour relations management.

For example, employers workforce/labourers, Government and trade unions.

## 5.5 RELATIONSHIP MANAGEMENT WITH SUPPLIERS, CUSTOMERS AND EMPLOYEES

**Q12. Explain the needs and importance of relationship management in SCM**

**Answer :** (Model Paper-II, Q10(b) May-14, Q6(b))

Relationship management in SCM aims at developing and managing sound relations with suppliers, customers and employees.

For remaining answer refer Unit-V, Page Nos. 519-522, Q Nos. 13, 14 and 15.

**Q13. What is supplier relationship management? State its need, importance and process.**

**Answer :**

### Supplier Relationship Management (SRM)

Supplier relationship management is about how the firm manages its relationships with suppliers. It includes extended procurement processes, sourcing execution, performance of supply chain etc.

Supplier relationship management consists of those processes which emphasize on upstream interface between the firm and its suppliers.

### Need for SRM

Supplier act as the bridge for distribution of finished goods are of the prime importance. An organization should maintain good relationships with the suppliers. SRM when executed and managed properly fulfills the firm requirements. The need for SRM arises,

- (i) When goods are to be physically sent to the market.
- (ii) When products are aimed to a particular target population.
- (iii) When new products are to reach the market.

### Importance of SRM

SRM serves the following benefits.

- (i) To design the product in collaboration with suppliers.
- (ii) To develop a increased value of the product through the process of design collaboration.
- (iii) To meet the requirements of supplier and facilitate in selection and evaluation of suppliers and helps in contract management.
- (iv) To negotiate the contract with suppliers and describe price and delivery parameters with respect to organizational goals.
- (v) To develop a common plan with suppliers through supply collaboration.

### Process of SRM

The following are the main SRM processes.

#### 1. Design Collaboration

Design collaboration deals with designing of the product in collaboration with suppliers. The manufacturer and its suppliers use sharing of engineering change orders for design collaboration activities to avoid costly delays. In the design stage if there is good collaboration it increases the value of product.

## 2. Source

The source process meet the requirements of suppliers and facilitate in selection and evaluation of suppliers and helps in contract management. Contract management is a key element of sourcing which helps in recording important information

On the following elements.

- ◆ Lead time
- ◆ Reliability
- ◆ Quality and price

This evaluation is of utmost important for improving the performance of supplier

## 3. Negotiate

The negotiation is a lengthy process which begins with Request For Quote (RFQ) and involves design and execution of auctions. The contract is negotiated with suppliers in such a way that describes price and delivery parameters which are in accordance with organizational goals

## 4. Buy

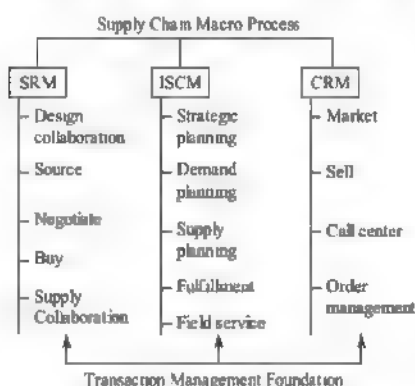
The buying process of materials involves acquiring material from suppliers which involves.

- (i) Creation
- (ii) Management
- (iii) Approval of purchase orders

## 5. Supply Collaboration

When the agreement between enterprise and supplier is final, it focuses on forecasts, production plans and inventory levels. The ultimate aim of collaboration is 'Common plan in the entire supply chain'

For a supply chain to be successful the three macro processes, SRM, ISCM and CRM should be well integrated



SRM - Supplier Relationship Management

ISCM - Internal Supply Chain Management

CRM - Customer Relationship Management

SRM processes include sourcing, negotiate buy etc. ISCM processes include strategic planning and meeting customer needs etc., and CRM processes involves market price, order management etc. All these processes are interlinked and essential for proper functioning of supply chain performance

The four grouping of competitors for SRM are,

1 and 2. Two best of breed groups of the two groups one deals with design collaboration and other with procurement

3. Best-of-breed ISCM vendor

4. FRP players

SRM's big players are ISCM and ERP. To gain competitive position in the market, SRM player should possess superior integration and superior ecosystems

**Q14. Define customer relationship management. Explain its need, importance and components.**

**Answer :**

### Customer Relationship Management (CRM)

CRM, short for customer relationship management aims to sustain economic relationship between customers and organizations for a long time. It has been defined as a core strategic process to build trust worthy relations between firm and customer by applying techniques to achieve customer satisfaction on one extreme and to obtain maximum profits on other extreme

Customer Relationship Management (CRM) maintain customer by focusing on their requirements and to fulfill it, also deals with their perception from diversified sources such as transaction records, call center logs, web site clicks and search engine queries

### Need for CRM

Need for CRM arises when,

- (i) It becomes essential for the management to develop sound customer relations
- (ii) To retain the customers by concentrating on their requirements and rendering valuable services

### Importance of CRM

CRM serves the following purposes,

- (i) CRM enables in customer segmentation to select specified markets and render unique service to each customer
- (ii) It helps to develop relationship marketing to provide product related information to the customers.

- (iii) CRM facilitates to forecast the customer preferences and pricing policies.
- (iv) To render best customer service by providing the right product to the right customer in the right time.

#### Components of CRM

Following are the components of CRM.

##### 1. Customers Segmentation

Customer segmentation is the basic principle of CRM intended to facilitate unique service to each customer. Segmentation undertaken by considering geographic region, customer preference, sales history, product attributes and profitability. This enables to select specified markets and render service which saves time and costs to the firm. Markets can be targeted by two ways, namely permission marketing and cross-selling.

###### (a) Permission Marketing

In this type of marketing customers have the facility to select the time mode of interaction with organization, i.e., either through conventional or by electronic methods. It is also called as 'relationship marketing'. It helps in providing product related information to the customers.

###### (b) Cross-selling

When firms are able to maintain more profits by selling additional products rather than original or primary products then it is termed as 'cross-selling'.

##### 2. Predicting Customer Behaviours

To operate the business smoothly for a long period of time every firm needs to outline certain predictions with regard to future. This constitute to forecast about customer preferences, pricing policies. One such technique is customer defection analysis. Firms apply this technique to know the perspective of customer with regard to purchase and their capacity to pay for the product after this firm adopt new policies to attract customers.

##### 3. Evaluating Customer Profitability

Earlier identifying customer profitability was a difficult task and also involves huge investment. At present, even though it is possible to evaluate the profitable proportion, but it may lead to inadequate decisions.

This could be on account of the customers who are beneficial in later stage prove to be unprofitable in initial stages and vice-versa.

##### 4. Customize Customer Communications

Firms try to communicate with customers individually by considering their preferences and behaviour. To operate their business continuously with customers, firms design each customer profile in their website and deliver the

information with regard to current products, ads, discounts and future schemes. One such technique of individualized communication is event-based marketing. Firms render event-based marketing services to the customers based on their durability. The prime objective of this marketing is to render suitable products at suitable time to the right kind of customers.

##### 5. Automated Sales Force Tools

These tools are applied to monitor the sales continuously and record field activities, review sales history to the firms who are away from office, ultimate idea is to rectify the ineffective policies and implement new policies wherever possible to increase sales productivity. Some of the tools of sales force are listed below.

###### (i) Sale Activity Management

Sales activity management tools are useful in guiding a sales personnel, throughout the sales process. This enables to proper sales activities and to maintain uniform sales process. Sales personnel interact with active as well as inactive customers through mailing and enhance the productivity.

###### (ii) Sales Territory Management

This technique ensures sales manager to know about the salesperson's activities with regard to customers and their performance. With the help of these tools, sales manager develops sales teams which are suitable to customer requirement, record performance of salespersons, etc.

###### (iii) Lead Management

Every salesperson while closing contracts with the customers abide to certain sales tactics in order to gain deals at high rates within less time.

###### (iv) Knowledge Management

To operate the business successfully, salesperson have to obtain various types of information in the whole selling process. This information is subjected to rules and regulations, corporate policies, term of contracts, details of customers, etc. Knowledge management tool facilitates in providing customer service and making quick decisions.

##### 6. Attributes of Best Customer Service

In general, a customer obtains best service if he receives a qualitative goods within time at reasonable prices and classification of his queries continuously by the firm.

Customer service definition also includes "Seven Rs Rule". The seven Rs are right product, in the right quantity, in right condition, at right place, at right time, for the right customer, at the right cost.

## SUPPLY CHAIN MANAGEMENT

The components of customer service is classified into three parts pre-transaction, transaction and post transaction.

### (i) Pre-transaction

Services rendered before the sale of the products such as framing the hierarchy of organisation policies, customer service policies, system flexibility etc

### (ii) Transaction

Services rendered at the time of selling the products like transporting the qualitative products in time

### (iii) Post transaction

The services that are offered after selling of product or service in the form of product return or warranty, complaint resolution, operating information etc, then it is termed as post transaction

Firms try to provide better customer service, in turn the customers are retained. Firms take into consideration seven Rs rule in order to be successful. Organisations use call centres, website self service, field service management etc., to enhance both the functions such as performance of supply chain and improvement of customer service

**Q15. Explain how an employee relationship management contributes to the growth of an organization.**

**Answer :**

### Employee Relationship Management

Employee Relationship Management (ERM) plays a key role in developing organization's value when compared to customer relationship management. Because, when the customers are not satisfied with the service rendered by one organization then they can easily switch to another organization, whereas employees do not have such option. Customers are exposed to experiences only of certain facts. Whereas, employees hold a long-term relationship with the organizations

### Need for ERM

The need for a ERM relationship arises,

- (i) When they communicate with each other
- (ii) When they are empathetic towards each other
- (iii) Continuous interaction with each other
- (iv) Mutual understanding between both the parties
- (v) One party comfortable with other party

Ultimately equal commitment from both the parties would enable in establishing a smooth functioning of relationship

In order to improve the relationship between management and employee technology can be made use. Technology is one of the important constituents in developing the relationship. Some of the facilities offered by technology are as follows,

- (i) Technology of knowledge management facilitates the employee to be aware of events occurring in the firm
- (ii) Firms offer bonus schemes in order to improve the performance of employees
- (iii) Technology of work flow systems ensure proper coordination and continuous flow of work
- (iv) Firms utilize payroll system to make accurate and on time payment of salaries to employees
- (v) To have direct interaction with employees, management exchanges its ideas, views and opinions with the employees
- (vi) Analyzing each employee's capability and knowledge to place them in a suitable position
- (vii) Providing feedback to the employees to improve their performance further in order to meet organizational goals
- (viii) It also provides the opportunity of on the self-training for employees in order to stay up-to-date and enhance the ability of the employees.
- (ix) The tools such as e mail, company portals and electronic calendars help employees in knowing the status of the company and to contribute their ideas effectively through this advanced technology

Employee relationship management will enhance productivity by enhancing employee morale, loyalty etc. Thus, employee relationship management is an essential element of the management and it is possible through the mutual understanding of both the management and the employees

### Importance of ERM

ERM the key part of relationship management provides following advantages,

- (i) Enhances employee morale and commitment towards the organization
- (ii) Increases productivity by enhanced performances
- (iii) Develops a mutual understanding and goal sharing between employees and organizations
- (iv) Develops a long-run relationships facilitating for smooth functioning of the organization

**SHORT QUESTIONS AND ANSWERS****Q1. Supply Chain Network Design****Answer :**

Supply chain network design is a process of determining the number of suppliers, the location of facilities, determining the product flow within the supply chain and location of distribution centres to effectively meet up the customer demand.

For the successful implementation of a supply chain strategy, it becomes necessary to align the supply chain network with that of supply chain strategy of the firm. Supply chain network design occupies the top most position in the supply chain pyramid which is responsible for managing the entire supply chain at tactical and operational level.

**Q2. Explain the role of distributors in SCM****Answer :***Model Paper-II, Q4*

Distributors play a very important role in supply chain management as they can effectively carry out the following functions which holds a significant impact on the firm's value and profitability. The following are the functions of

- a) Selling and promotion
- (b) Buying and bundling product assortments
- c) Bulk breaking
- d) Value added processing
- e) Transportation
- (f) Warehousing
- g) Merchandising
- h) Marketing information
- (i) Sequencing

**Q3. Write a note on role of HRM in SCM.****Answer :**

Human resource plays a key role in supply chain management. Supply Chain Management (SCM) is the management of supply chain activities such as procurement, manufacturing, sourcing and other inventory management activities. Effective management of supply chain helps the organization in gaining competitive advantage over other competitors. The various parties involved in SCM are, suppliers, vendors, distributors, wholesalers and retailers. On the other hand, Human Resource Management (HRM) is all about managing people and it is also one of the way to achieve competitive advantage.

**Q4. Workforce Management in SCM***April-15, Q1(i)***OR****Workforce Management****Answer :***(Model Paper-I, Q5 | May/June-13, Q1(i))*

Workforce management is a process which is used by a public or private entity to optimize the productivity of employees at all the levels of the organization. It helps in staff planning and optimization. It is usually applied to staffing the customer support center. WFM deals with optimizing staffing levels in terms of both numbers and skill sets. Workforce management tools can analyze historical call types and volumes and help suggest optimal call center staffing. It quantify the amount and type of labour required to do a particular job on a hourly or daily basis.

**Q5. Role of employees in Supply Chain****Answer :***May/June-16, Q1(i)*

The employees play a vital role in designing networks and allow the firm to achieve its strategic goals in supply chain management. For this, the employees need to have a clear understanding about the concepts and models used by the organization. The designing of networks result in decreasing the cost and achieving customer service at high level. Thus, employees plays a significant role in the management of supply chain.

**Q6. What is channel design and channel management?**

**Answer :**

*Model Paper-III, Q1*

**Channel Design**

Channel design refers to the involvement of an organization in logistics, production, R and D, product launch, sales channel design and other tasks. It mainly deals with the analyzing of customer needs, establishing channel objectives, identifying the major channel alternatives and then evaluating them. Channel design follows a structured approach by making use of the certain criteria which is used to evaluate options, channel structures.

**Channel Management**

The channel management generally includes all the activities which are involved in the distribution function of a firm. For the purpose of decision making, distribution strategy provides guidelines. The distribution management function deals with the implementation of the distribution strategy of the firm.

**Q7. What is Customer Relationship Management (CRM)?**

**Answer :**

CRM, short for customer relationship management aims to sustain economic relationship between customers and organizations for a long time. It has been defined as a core strategic process to build trust worthy relations between firm and customer by applying techniques to achieve customer satisfaction on one extreme and to obtain maximum profits on other extreme.

Customer Relationship Management (CRM), maintain customer by focusing on their requirements and to fulfill it, also deals with their perception from diversified sources such as transaction records, call center logs, web site clicks and search engine queries.

**INTERNAL ASSESSMENT****I. Multiple Choice**

1. What factors affect the transportation selection decision? [    ]
  - (a) Characteristics of the customer
  - (b) Product features
  - (c) Market structure
  - (d) All the above
2. The investment in stock is waste as it has no demand in the market. [    ]
  - (a) Safety stock
  - (b) Seasonal stock
  - (c) Dead stock
  - (d) Cycle stock
3. \_\_\_\_\_ will enhance productivity by enhancing employee morale and loyalty. [    ]
  - (a) ERM
  - (b) SRM
  - (c) SCM
  - (d) CRM
4. \_\_\_\_\_ means the variety of products which are offered by the distribution network. [    ]
  - (a) Response variety
  - (b) Product variety
  - (c) Product availability
  - (d) Order visibility
5. \_\_\_\_\_ are the logistics costs. [    ]
  - (a) Inventory cost
  - (b) Transportation cost
  - (c) Facility cost
  - (d) All the above
6. Tax rates, tariffs, exchange rates, demand risk etc are the \_\_\_\_\_ factors. [    ]
  - (a) Socio economic
  - (b) Political
  - (c) Macro economic
  - (d) Infrastructure

7. \_\_\_\_\_ play a major role in gathering reliable marketing information. [ ]
- Distributors
  - Suppliers
  - Customers
  - None of the above
8. Both \_\_\_\_\_ and \_\_\_\_\_ activities goes side by side in carrying out the functions of the firm effectively. [ ]
- HRM and CRM
  - HRM and SCM
  - HRM and SRM
  - SCM and ERM
9. A strategy that helps in meeting the needs and expectations of a customer in such a manner so as to increase the profitability of the firm is \_\_\_\_\_. [ ]
- Marketing strategy
  - Promotion strategy
  - Customer service strategy
  - Customer relationship management.
10. \_\_\_\_\_ are the components of CRM? [ ]
- Customer segmentation
  - Relationship marketing
  - Logistics management
  - Both (a) and (b)

## II. Fill in the Blanks

- The market structure can be divided into \_\_\_\_\_ and \_\_\_\_\_ markets.
- \_\_\_\_\_ stock is maintained before the occurrence of a particular season in order to avoid the inventory shortages.
- Safety stock is like an emergency stock which is maintained to face the \_\_\_\_\_ situations.
- \_\_\_\_\_ occupies the top most position in the supply chain pyramid.
- While selecting the suitable distribution network design, the managers are supposed to take into consideration the \_\_\_\_\_ and \_\_\_\_\_.
- \_\_\_\_\_ refers to the involvement of an organization in logistics, production, R&D, product launch etc.
- Political factors includes \_\_\_\_\_ and \_\_\_\_\_ of the countries.
- \_\_\_\_\_ is all about managing people and is one of the way to achieve competitive advantage.
- Supplier relationship management consists of those processes which emphasis on upstream interface between \_\_\_\_\_ and \_\_\_\_\_.
- \_\_\_\_\_ aims to build and sustain economic relationship between customers and organizations for a long period of time.

**KEY****I. Multiple Choice**

1. (d)
2. (c)
3. (a)
4. (b)
5. (d)
6. (c)
7. (a)
8. (b)
9. (c)
10. (d)

**II. Fill in the Blanks**

1. Territorial and Competitive
2. Seasonal
3. Unpredictable
4. Supply chain network design
5. Product characteristics, network requirements
6. Channel design
7. Political stability, legal systems
8. HRM
9. Firm, suppliers
10. Customer relationship management.

**III. Very Short Questions and Answers****Q1. Write about Supply Chain Network Design.****Answer :**

Supply chain network design is a process of determining the number of suppliers, the location of facilities, product flow within the supply chain and location of distribution centres to effectively meet up the customer demand.

**Q2. Write a note on Merchandizing.****Answer :**

Merchandizing can be carried out effectively by the distributor along with the retailers who provide the best product and service mix in order to match the promotion strategies.

**Q3. What is Channel Design?****Answer :**

Channel design refers to the involvement of an organization in logistics, production, R&D, product launch, sales channel design and other tasks.

**Q4. What factors influence Distribution Network Design?****Answer :**

The factors which influence the distribution network design are,

- (i) The degree to which the customer's needs are fulfilled and
- (ii) The cost of meeting the needs of the customers.

**Q5. What is Outlet Selection?****Answer :**

Outlet selection adds complexity to the entire logistics strategy. It mainly depend on the nature of products and their characteristics.

**Q6. Show any one linkage between HRM and SCM.****Answer :**

HRM activities are must in any firm. This forces the SCM partners to take up the HR practices which results in effective way of achieving competitive advantage.

**Q7. What is Supplier Relationship Management (SRM)?****Answer :**

Supplier relationship management is all about how the firm manages its relationships with suppliers. It includes extended procurement processes, sourcing execution, performance of supply chain etc.

**Q8. State the components of CRM.****Answer :**

Customers segmentation, predicting customer behaviour, evaluating customer profitability, customize customer communications, automated sales force tools and attributes of best customer service are the components of CRM.

**Q9. Write a note on Employee Relationship Management.****Answer :**

Employee Relationship Management (ERM) plays a key role in developing organization's value. It will enhance productivity by enhancing employee morale and loyalty.

**Q10. What do you mean by Workforce Management?****Answer :**

Workforce management is a process which is used by a public or private entity to optimize the productivity of employees at all the levels of the organization.

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